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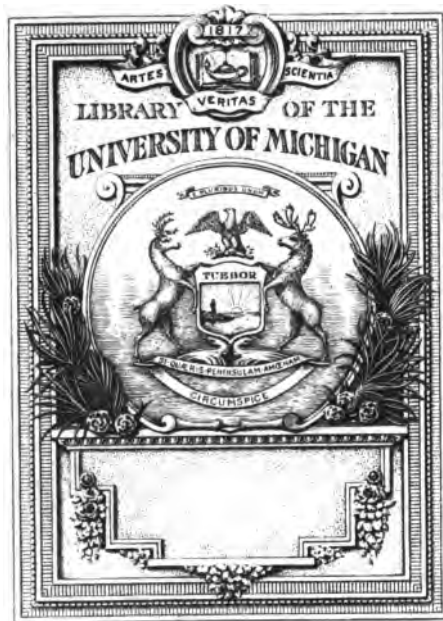
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[Issue, 10,000.]

New Zealand Department of Agriculture.

JOHN D. RITCHIE, *Secretary.*

UNIV. OF MICH.

SEP 3 1906

AGRICULTURE

IN

OTHER LANDS

(GREAT BRITAIN, DENMARK, CANADA, SOUTH AFRICA, AND
ARGENTINE),

WITH SPECIAL REFERENCE TO DAIRYING.

BY

J. A. KINSELLA, DAIRY COMMISSIONER.

ILLUSTRATED.

HON. T. Y. DUNCAN, MINISTER FOR AGRICULTURE.



WELLINGTON.

BY AUTHORITY: JOHN MACKAY, GOVERNMENT PRINTER.

1906.

THEORY OF THE EARTH

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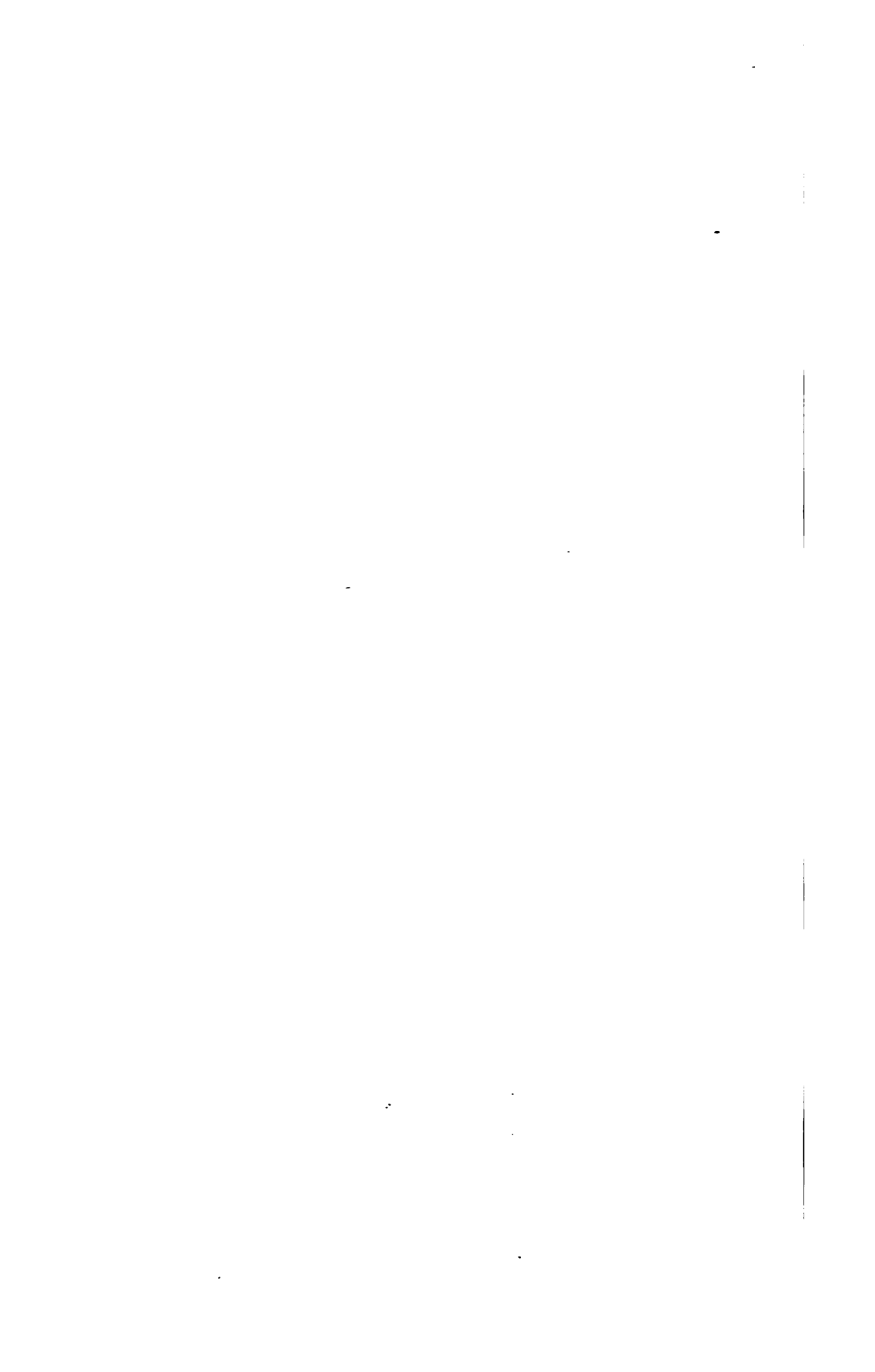
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AGRICULTURE IN OTHER LANDS.

BRITISH REPORT.

SIR,—
Office of the Dairy Commissioner,
Wellington, 9th August, 1905.
I have the honour to submit herewith a report on my investigations into the produce trade in Great Britain, and a brief report on my hurried visit to Ireland and Denmark.

I also append a report on inquiries which I was instructed to make on the cool-curing of cheese in Canada.

Owing to my continued illness after arrival in this colony and the preparation of the Annual Report, this report was, I regret to say, unavoidably delayed.

I have, &c.,

J. A. KINSELLA,

Dairy Commissioner.

The Secretary for Agriculture, Wellington.

1. TEMPERATURES OF OUR PRODUCE ON BOARD HOME STEAMERS.

BEFORE leaving Africa I received instructions from the Government to proceed to the Argentine, to investigate matters connected with agriculture, and especially with regard to dairying.

I left Cape Town on the 31st January, 1904, and travelled by the steamer "Langton Grange" to Buenos Aires.

During the voyage I prepared a special report on the trade of the colony with South Africa, which was forwarded from South America to the New Zealand Government.

During my stay in the Argentine Republic I found it difficult to obtain reliable information, on account of the fact that most of the people speak the Spanish language only. I was, however, able to secure a good deal of trustworthy information in connection with the methods of dairying, wheat-growing, sheep-raising, and also with regard to the freezing establishments in the republic. During the voyage from Buenos Aires to London I prepared a somewhat lengthy report on my investigations in the Argentine, and this was forwarded to the New Zealand Government when completed.

Having spent the greater part of four years in New Zealand, during which time I had been intimately connected with the dairying industry, I was anxious to get some information in regard to the temperature at which our butter and cheese is actually carried between New Zealand and the Home markets. I therefore took the opportunity of travelling by the New Zealand Shipping Company's steamer "Turakina" from Monte Video to London, the trip occupying nearly twenty-five days. During that time I was afforded every facility by the chief refrigerating engineer, and especially by the second refrigerating engineer, to become acquainted

with the exact temperatures at which our butter and cheese were carried during the voyage. I found that the butter was held at a temperature of between 10° and 12° Fahr., and that the cheese was carried at about 45°. The reliability of the logs kept by the various engineers on board the Home steamers has been questioned by some of our dairymen in the past, and it has been suggested at meetings held by the National Dairy Association (South Island) that a practical man should be sent Home by the Government, partly with a view to examining the temperatures as recorded by the engineers. I am glad to be able to clear this matter up, and I trust that the result of my investigation will give satisfaction to dairymen throughout the colony. I cannot speak too highly of the careful manner in which the refrigerating engineers looked after the temperatures of both our butter and cheese, and of the way in which this shipment, which comprised some 42,000 boxes of butter and a large quantity of cheese, was handled on the arrival of the steamer in London.

Of course, it has been generally recognised for a long time that the temperatures at which our butter and cheese have been carried on board the contract steamers which trade between New Zealand and London have been sufficiently low to prevent any serious deterioration taking place in the quality of the butter and cheese during transit. From my experience with this shipment, and from the information obtained in Great Britain, I am strongly of the opinion that no other country except Denmark ships its butter in better condition than we do from this colony. The various reports which we receive from the Produce Commissioner in London prove that the temperature in the holds of the ship carrying butter for the British markets averages about 10° to 12° Fahr., or even less in many cases. While this seems a very low temperature in comparison with the temperature at which Canadian and Australian butter is carried, I am of the opinion that it would be better if it could possibly be arranged to carry the butter at a still lower temperature. Experiments have been carried out in a small way in the United States by holding the butter at zero, with a view to ascertaining if the butter will keep better than at, say, 10 degrees of frost. I consider that it will be advisable to carry on some experiments of this nature in the colony, in order to prove whether such a change would be beneficial to our dairy industry. I may point out that the contract boats trading between New Zealand and Great Britain are fitted with very powerful refrigerating machinery in duplicate, by which means the temperature is under the complete control of the engineer. In the event of accident to one of the refrigerating machines during the voyage, the other machine is sufficiently powerful to keep the produce at a fairly low temperature.

The dairymen of New Zealand should feel proud that we have such an excellent system of carrying our produce to the British markets. When it is remembered that butter from the Commonwealth of Australia is sometimes landed in England at 35°, and not very often below 30°, it will be seen that our system is much superior and more reliable. The Government and the National Dairy Associations of this colony are therefore to be commended for the manner in which they have assisted the producers in bringing about the results above mentioned with regard to the shipment of our butter.

TEMPERATURE OF CHEESE IN TRANSIT TO BRITISH MARKETS.

Being aware that a diversity of opinion existed as to what is the best temperature at which to carry cheese from the colony to the Home market, I paid close attention to this important matter during my visit to London and the Scotch markets.

The cheese arriving in Great Britain during the time I was in that country were principally autumn make, and I have no hesitation in saying that the tendency of late has been to carry our cheese at too low a temperature, more especially the spring and autumn cheese. The weather during these seasons is usually cool, and the cheese generally mature somewhat slowly. Dairy companies are also anxious to ship away as much as possible of the cheese by the earliest available boat, in order to catch the most favourable market. As a consequence, many of our factories ship their cheese in a green condition, or, in other words, almost before the process of curing gets well started. If the ship's cheese-chambers are held at the temperature mentioned in the contract between the National Dairy Associations and the shipping companies—viz., 40° to 45°—the process of curing is checked to a certain extent. On the other hand, if our spring and autumn cheese were carried at a temperature of, say, 50°, the process of curing would go on slowly, and on the arrival of the cheese in Great Britain, instead of being in a green, immature condition, they would break down better and give greater satisfaction to the purchasers.

Personally, I have always considered 40° much too low a temperature at which to convey our spring and autumn cheese to the British market—that is, under our present methods of shipping green cheese. On the other hand, until some improvement is brought about in the curing-rooms throughout the colony, the cheese which are made during the hottest months, and which in many cases become slightly heated, would carry better at below 45°, because if the cheese once become heated and the butter-oil is extracted they have a tendency to go off in flavour. By reducing the temperature as above stated, the deterioration during transit would not be so great. The general complaint made to me by the British buyers regarding New Zealand cheese was that our spring and autumn productions were nearly always found to arrive in a stiff or uncured condition, and it is a well-known fact that the British buyers like a cheese fairly well matured, so that it will break down smooth between the thumb and finger, and present a silky appearance. Mr. Cameron, New Zealand Produce Commissioner in London, has also written on this subject on several occasions. As there is evidently need for improvement in the direction indicated above, I have conferred with the executive of the Dairy Associations of the North and South Islands, and have impressed upon them the advisability of having the terms of contract with the shipping companies modified, so that our spring and autumn cheese would be carried at a different temperature from that of the cheese cured during the very hot months.

2. NEW ZEALAND BUTTER AND CHEESE IN GREAT BRITAIN.

During my recent visit to London I called on and interviewed the principal merchants handling New Zealand butter and cheese. The majority of these are direct importers, and have their head offices and warehouses in Tooley Street, with branches and agents in the various ports and towns of the United Kingdom.

A great deal has been heard about the deterioration which takes place in the quality of our butter during the long voyage Home, and the condition of it on its arrival in London, so far as temperature is concerned. We also hear of some of our butters developing what is called "fishiness," and we get the general comments on the body, texture, moisture, colour, finish, &c., of our goods. The above being so, I determined that

the object of my investigations should be along thoroughly practical lines, and being a practical butter and cheese maker, and having a good knowledge of our methods of manufacture, and also of our system of grading, freezing, shipping, &c., the information obtained by me from the principal handlers of our produce is therefore fairly accurate.

When in Tooley Street I received every courtesy at the hands of the various merchants, none of whom refused to supply me with information concerning our produce. At the numerous warehouses I was afforded opportunities of sampling our butter and cheese, as well as many brands of the same from other countries—viz., Denmark, Russia, Siberia, Canada, Australia, Ireland, and the Argentine; and, having a knowledge of the process of manufacture in all these countries, except Russia and Siberia, they afforded excellent chances for comparison between our produce and that of these other countries.

QUALITY OF BUTTER.

Almost every merchant with whom I examined the goods, and discussed the question of quality, spoke in the highest terms of the flavour and make of our factory butter. The main points praised were:—

- (1.) Uniformity as far as body and texture were concerned.
- (2.) Uniformity in regard to the amount of moisture, salting, and colour.

Not a single complaint was made as to the general get-up of our packages, the branding, finish, &c., being all that was desired.

During my stay in London and while visiting the Scotch markets I made careful inquiries regarding so-called "fishiness" in the flavour of our butter, but found it difficult to locate any real fishy-flavoured samples of that season's make. It seemed that while I was in Great Britain the fishy flavour sometimes mentioned as having been found in our butter had ceased for a time. I discovered a few boxes of New Zealand butter which were termed "fishy" by the agents and dealers, but in these cases the butter was old. Two boxes shown to me were nearly a year old, but as to the treatment they underwent during all that time I was unable to obtain any information.

A strange phase of the question is that the flavour which the British purchasers term "fishy" is sometimes found in the product of some of our highest-grade factories.

A stranger problem to be solved is, why one of our choice brands may give entire satisfaction and realise top market price one year, the next year the same brand on being sent to an entirely different market may be pronounced "fishy," while the third year the same factory's brand may go to another market, where it may be classed the same as it was in the first year—namely, "choicest."

I examined many samples of Russian, Siberian, and some Australian butters which possessed a fishy flavour. It was more pronounced in the two former. The Russian and Siberian, and also some Dutch butter which I examined, certainly could be termed "fishy," the salt-herring flavour being distinctly noticeable both to the nose and the palate. The samples of Australian and the few boxes of New Zealand, examined in company with British expert judges, and all termed "fishy" by the latter, were, in my opinion, different kinds of fishy butter. As a practical butter-maker and a judge of butter, I found, after careful examination of three or four lines—all different—that there was an entirely different flavour noticeable in each brand. In my opinion, a large

number of the butter-tasters in Great Britain term nearly all stale and tallowy butters "fishy." Notwithstanding this fact, I met some excellent judges of butter. Going a little further into this question, I may point out that I saw unsalted tallowy butter—which had reached a good age—termed or classed as "fishy"; then, again, a tough, waxy-bodied butter which contained a large percentage of salt, and possessed an old rank flavour, would also be termed "fishy." In no case, however, did I hear a butter pronounced fishy which possessed a strong weedy or turnip flavours which are due to absorption, or caused by the feed given to the cows.

There have been many theories advanced as to the cause of fishiness in butter. One which seems the most likely is that it is caused by a living organism which gains access to the milk.

Mr. E. O'Callaghan, of New South Wales, claims to have isolated a germ which he calls "*Oedium lactis*," and he claims to be able to produce fishy butter by inoculating pasteurised cream or milk with this organism. A culture of this organism *Oedium lactis* was secured from Mr. O'Callaghan's laboratory in Sydney by the writer, and experiments were conducted by the Government Bacteriologist, Mr. Gilruth, and myself, by inoculation of cream; with the result that, although the butter produced contained the *Oedium lactis* in large numbers, the butter did not develop a fishy flavour, even although kept under observation for some considerable time.

I shall not attempt to explode the *Oedium lactis* theory, because I have not had an opportunity of experimenting to any great extent with that organism. I believe, however, that if this germ causes fishiness in butter, there must be different species of *Oedium lactis*. As evidence in support of my opinion as above, I beg to state that the Government Bacteriologist has found by bacteriological examinations large numbers of the *Oedium lactis* in some samples of an article which is put on the market as a pure culture for the ripening of cream, and from which culture good results were obtained, without any trace of fishiness. Other cream-ripening starters made from a home-prepared sterilised culture were also examined by Mr. Gilruth, and, as with the commercial culture, *Oedium lactis* was again proved to be sometimes present. A remarkable thing about this fishiness is, that on the occasions on which these *Oedium lactis* cultures were used, the factories were unable to produce fishy-flavoured butter.

In view of the facts above stated, I cannot hold any opinion other than that which I expressed a few years ago—namely, that the cause is due to filth, and the remedy is, get rid of the filth by insisting on clean milking, clean cow-byres and healthy cows, clean milk wagons and cans, clean milking-utensils, clean factories, clean managers, good drainage, pure water-supply, good salt, and careful methods of manufacture.

3. DAIRY BUTTER.

With regard to dairy butter, I found that many of the small dealers and retailers were ignorant of the distinction between our private-dairy butter and our creamery butter. They were not aware that these are two distinct classes of produce manufactured under totally different conditions. These merchants were therefore puzzled to find that our first-grade dairy butter did not compare favourably with the first-grade creamery, owing to their not knowing that the standard for dairy butter in the colony was lower than that for creamery. All they appeared to be

cognisant of was the fact that it was New Zealand butter, and that each box bore a grade-stamp of similar design, and they were utterly at a loss to understand how a first-grade dairy butter was not of the finest quality. Several of these dealers confronted me with the remark, "Do you call this good butter?" When I explained that dairy butter was, as a general rule, of a secondary quality as compared with creamery, I was asked why dairy butter was marked "First grade." It will be seen, therefore, that there is urgent need for one of two things—namely, that we must take steps to improve the quality of the dairy butter manufactured in the colony, or we must brand it differently, in order to prevent misunderstandings of the above nature.

In my opinion all private dairies should be re-registered, and some form of instruction and inspection adopted, whereby the quality of dairy butter would be improved. Up to the present time, beyond the registration of these dairies, and the grading of the butter made by hand, nothing has been done to help the owners to manufacture a better article. Of course, it has been quite impossible for this Division to cope with the work of instruction at the dairy farms, owing to the limited number of men employed on the staff, as the butter and cheese factories naturally have to receive first attention, thus leaving no time to assist the makers of dairy butter. I have long recognised the necessity of assisting the private maker, and would gladly undertake such work, provided the necessary assistance could be given to me to carry out a complete scheme.

The position is that, under existing conditions, the classifying, stamping, checking of weights, &c., by the Government is encouraging the production of an increased quantity of dairy butter, but this is being done irrespective of the quality, which shows no signs of improving. Then, again, many of the storekeepers in the dairying districts are encouraging the manufacture of dairy butter, and this is not in the best interests of the farmers.

Apart from poor quality—which means a low price—there is a loss made in skimming and churning, to say nothing of the waste of time and labour. At the ordinary farm dairy no arrangements are made for controlling the temperature of the cream, and the butter during the hot weather is usually churned in a semi-liquid condition, which makes it almost impossible to get rid of the buttermilk, therefore the keeping-quality of the butter thus produced is seriously affected.

The private farmer who runs his own separator very often does not pay sufficient attention to the temperature of the milk and the speed of the machine. This means an enormous loss in skimming in some instances, and, although the calves and pigs get the benefit of this loss, when the separator milk is fed to them, it must be remembered that it does not pay to feed stock on butter-fat, which is usually worth not less than 9d. per pound. First-class calves can be raised on factory skimmed milk if fed to the animals in a clean and sweet condition, provided a small quantity of suitable food is added to the milk to take the place of butter-fat.

Of course, I am well aware that in many of the isolated districts where there are no factories established, and in places where there are no proper roads, the settlers are compelled to manufacture their own butter. Those private makers, however, who have the advantage of being within a reasonable distance of a dairy factory or creamery would find it much more advantageous to deliver their milk where it can be made up into a higher-grade article, instead of attempting this work themselves.

4. MILLED BUTTER.

That the export of milled butter from New Zealand is a menace to our trade with the British merchants and consumers has to be admitted. From the information I obtained in the British market regarding milled butter, I am forced to the conclusion that it would be to the advantage of a very large majority of the producers in the colony if the exportation of milled butter was prohibited by law. Incalculable harm is undoubtedly being done to New Zealand's dairy industry through the traffic in some of the wretched stuff shipped to the United Kingdom as "milled butter."

The boxes containing this class of dairy-produce—if it can be rightly so called—are marked with the words "New Zealand Produce. Pure milled butter"; and the quality of some of this butter which has come under my notice from time to time has been so inferior that to call it impure would be to describe it by a very mild term.

As with dairy butter, many of the retailers who purchase milled butter are unacquainted with the circumstances under which this butter is collected and packed at the various centres, and also with the treatment it receives when held by the packers until a sufficient quantity has been gathered together to make up a consignment or shipment.

It will be easily understood that a purchaser who happens to procure a quantity of milled butter, and who does not understand its relative value to New Zealand creamery butter, will be much disappointed. If it should happen to be his first transaction in New Zealand butter, he would naturally be prejudiced against doing further business.

It may be argued that Graders have power under the Dairy Industry Act to prevent exportation of inferior produce; but this only applies to butter which is—as it is termed—unfit for human consumption. Seeing that butter can be used for human consumption even although it is of a rank or rancid flavour, without any apparent injurious effect, the Grader is almost in a dilemma to know just where to draw the line. In the past butter has only been condemned when it was found to be in a high state of putrefaction.

To continue to export inferior milled butter, branded as New Zealand produce, and to place it on the same market as that of our best creamery, is a fatal mistake. If it could be placed on an entirely different market, where there was no chance of it affecting the sale of our best brands of butter, the difficulty would be overcome.

Mr. H. C. Cameron, the New Zealand Produce Commissioner in London, makes the following remarks in one of his reports on the milled butter trade:—

"Certain consignments of milled butter have been coming to hand for some time branded 'Separator' in addition to the regulation 'Milled' brand, this practice being allowed, I understand, on the packers representing that the farmers from whom they gathered the butter used hand-separators. That such concessions are apt to confuse the trade at this end, and depreciate the Government branding system in their estimation, came practically to my notice in the dock-shed while inspecting a shipment. An importer who was pushing business with a large Cardiff buyer showed him among other brands milled butter, the boxes of which were stencilled 'Separator' in bold letters on the side. Pointing to this mark the importer claimed that this butter was not milled, and was equivalent to creamery. As in the Irish butter trade the term 'Centrifugal' is applied to creamery goods, the buyer in question was naturally perplexed, relying as he did on all branding of New Zealand butter as

official. I had, however, an opportunity of putting this matter straight in this particular case."

5. QUALITY OF CHEESE.

I was able to locate and examine a number of brands of our cheese in the various warehouses in Tooley Street; I also had an opportunity of sampling some shipments of New Zealand cheese in the harbour-sheds on their arrival in London.

Although I found many of our factories sending cheese of excellent quality, I regret to have to state that shipments from a few were found to be very irregular in quality, and in some cases this irregularity was due to faulty manufacture, such as having too much acid, being weak and open, and a few showed pinholes and gaseous formations. The main fault, however, with some of our brands was irregularity in flavour. In a few factories' brands I found many of the cheese to possess distinctly "off" flavours. This latter can only be overcome by cleaner milk or better raw material being furnished to the managers, and perhaps I may suggest that, from practical experience and observation at some of our cheese-factories, cleaner factories and cleaner methods of manufacture would help us over a great deal of the trouble complained of.

Many of the merchants complained of our spring cheese being shipped too green, often arriving in London in an uncured condition. Some of the autumn cheese examined by me showed signs of being shipped from the factory before the curing process had sufficiently advanced; that, along with the low temperature at which they are held during transit, caused them to arrive in London in an immature state. This condition of affairs leaves room for complaint regarding quality, on the ground that the cheese are not ready for immediate consumption.

6. OUR BUTTER AND CHEESE IN THE PRINCIPAL CITIES OF ENGLAND.

While in England I visited the principal cities, outside of London, handling our produce. The information which I was able to gather from many of the dealers was similar to that which I obtained in Tooley Street.

In large cities, such as Manchester and Liverpool, I was surprised to note that our produce was not handled in such large quantities as I had expected. The importers are anxious to handle our butter and cheese, but do not seem inclined to extend their business with New Zealand to any large extent on the lines on which our producers are in the habit of transacting their business. Many of the dealers complained seriously of the present methods of distributing New Zealand butter and cheese in England. The whole question amounts to the fact that our producers have no regular system of selling from year to year, with the result that when different brands of our butter have just become introduced to their customers, the dealers are not able to secure a regular supply of such brands, or even a continuous supply of a similar quality of New Zealand butter, to satisfy the demands of old customers who ask for New Zealand butter. A merchant in, say, Manchester or Liverpool who handles some of our best brands for a season may, by advertising, work up a good demand for these special brands. It is easily understood that any system which would interfere with his procuring those brands during the succeeding season or seasons (excepting possibly second-hand through London) must be prejudicial to business.

In Cardiff and Bristol I was better pleased with what I saw and heard. While our produce seems to be gaining ground in both these places, the same complaints were made with reference to our methods of selling, or rather, as some of the dealers put it, our system of the various factories gambling on different markets each season. At these two latter large distributing centres I found the people anxious to do business direct with New Zealand. They have enormous freezing-works and ample storage accommodation. I interviewed several of the directors and managers of these works, and they all expressed their willingness to assist in every way possible, by giving reduced rates and special attention to our goods, in order to encourage direct trade with the colony. Not only did I find more than ample storage accommodation in these cities, but the chairman and directors of each of the cold-stores were anxious to secure business, many of them offering to assist with clerical work in connection with the distribution of our produce in a proper manner. Now that we have a direct service with these west coast ports, it is to be hoped that some better system will be adopted whereby our butter and cheese will be placed regularly on these important distributing markets or centres.

In speaking of our west coast direct service, the question of our Government erecting freezing-works or cold-stores at the principal distributing centres naturally follows. I have already explained the willingness of the owners of freezing-works and cold-stores to co-operate with our producers and shippers at these centres, and I am of the opinion that if proper arrangements were entered into with these companies, our butter and cheese could be stored, chilled or frozen, and distributed equally as cheap and well as it could be done had the State or producers stores of their own. Many of the owners of these stores are seeking for business at reduced rates, owing partly to the fact that some of the stores are now lying idle.

7. OUR BUTTER ON THE SCOTCH MARKETS.

In Scotland I found our butter was fairly well known. The principal cities I visited were Glasgow, Edinburgh, Aberdeen, and Leith. These are the cities from which the bulk of our butter is distributed to the Scotch markets. Although some people in the colony contend that our butter and cheese are not known on the Scotch markets, and Home markets generally, I was agreeably surprised to find the Scotch dealers and the consumers of our butter so well acquainted with our system of instruction, official grading, and checking of weights. I called on many of the grocers in some of the cities mentioned, and found that many of them knew a great deal about our most important factories, and knew which individual factory's brand of butter was the soundest on arrival, and the best keeper.

A great deal of credit is due to Mr. H. C. Cameron, our Produce Commissioner in London, for the energetic and untiring efforts he has used in endeavouring to advertise our produce on the Home markets. The Divisional or subreports issued by the Dairying Division describe in concise form the working of the dairying industry for each year, and these are distributed by Mr. Cameron throughout the British trade, and are highly appreciated by the people. These reports and the yearly issue of our factory list, giving full particulars of every brand of butter shipped from the colony, are proving of inestimable value in the direction of advertising our produce on the Home markets.

It was proposed by the Agricultural Department three years ago to

discontinue the issue of these Divisional reports. At that time I pointed out that it would be a grave mistake to do so, and now that I have had an opportunity of conferring with the people interested in the handling and consuming of our butter and cheese, I am convinced of the importance of having these subreports published at the earliest possible date after the completion of the butter and cheese season, and distributed throughout the trade at Home as soon as possible. My experience has been that where the butter and cheese industry is dealt with in a neat bulletin or report, the trade interested in this particular industry are more likely to read such reports; on the other hand, where a large report such as the General Report of the Department of Agriculture is received by a busy butter and cheese merchant at Home, it is generally placed in a pigeon-hole without being referred to at all.

I have repeatedly during the past few years pointed out the necessity and importance of having these reports before the public earlier. Although the Divisional reports were prepared in good time, they were not ready for distribution amongst the dairy-farmers and butter and cheese makers until the following season was over. This delay renders the reports almost valueless for the new season, particularly so in as far as the recommendations for hints for improvement in quality, faults found with previous season's goods, &c., are concerned. The Produce Commissioner complains seriously of the same matter, contending that the reports would be of much greater value were they received by the trade before the new season's business commenced.

When in Leith one of the merchants whom I interviewed caused me to tremble in my shoes by making a heated attack on the Government of New Zealand on account of the manner in which it was advertising and supplying merchants in the Old Country with information regarding our produce. He claimed that it was not fair to those who first engaged in the trade that the New Zealand Government should endeavour to get others to do likewise. He was particularly strong in his condemnation of our Government supplying the trade with pamphlets describing our methods of manufacture, grading, &c.; he also objected to our Government allowing its representative to distribute amongst the trade these important pamphlets, including our yearly factory list, which contains the names of our factories, their total output, the addresses of their secretaries, &c. Although this gentleman complained so seriously on the lines above quoted, in answering my question he did not state that he was not pleased to get this valuable information for himself from the Government's representative. It was pointed out that the New Zealand Government considered it to be its duty to do everything possible (like our friends in the United States and Canada) to acquaint the people at Home who consume our butter with the fact that the Government is straining every point to assist the producer in manufacturing an article which will meet with the trade's entire satisfaction, also that through the State instruction, grading, and freezing of our butter they could depend upon a choice quality. If only those merchants who entered the New Zealand dairy-produce trade first were allowed to control the whole of our output, our goods would not be sought after as they are at present.

No doubt men possessing such narrow views as the one above mentioned would object to the Canadian Government's excellent idea of advertising the fine flour of the Dominion. At the large exhibitions in the Old Country, Canadian wheat, such as Manitoba No. 1 hard, is

ground by the roller process, baked into excellent bread, which is spread with the finest Canadian creamery butter, and then distributed to the hungry public as an advertisement for Canadian flour. All this is done on the spot before the eyes of thousands of British consumers. This is one of Professor J. W. Robertson's level-headed ideas, and in my opinion it has done more to advertise Canadian wheat and flour in Great Britain than a dozen men could have done by giving lectures from public platforms.

In quoting the above, with reference to advertising our produce at Home, I do so with the view of pointing out the narrow-mindedness of some of the Home merchants, and also the great difficulties which our Produce Commissioner has to overcome in doing his utmost to further the best interests of our Government and the producers of this colony.

QUALITY OF OUR BUTTER.

On the Scotch markets I obtained the opinion of the principal handlers of New Zealand butter, and in nearly every case I was told that our butter gave general satisfaction to their customers. Of course, an occasional complaint was made about some of our brands, but this happens with goods from all countries. The general appearance, branding, and get-up of our butter was highly commented upon.

I found New Zealand butter handled as far north as Aberdeen, and even away in the Highlands of Scotland in the Town of Elgin, and still some of the writers in the dairy papers in the colony state that they travelled all over Great Britain, with the result that they found that our butter was not known, but that Danish was known and found everywhere. The fact of Denmark having about ten times the quantity on the British markets makes its product easier to find, as compared with our comparatively small output. These facts are often lost sight of.

SCOTCH MERCHANTS ON OUR METHODS OF SELLING.

I have already pointed out the feeling which exists in Manchester, Liverpool, Bristol, Cardiff, and other towns in England regarding what merchants term "New Zealand's gambling trade methods." I cannot pass, however, without conveying to our producers the opinions held by many of the Scotch buyers.

At Glasgow I found that fairly large quantities of our butter were handled, and in interviews with the largest dealers they expressed dissatisfaction with the present prevalent methods of distribution of New Zealand produce at Home. The same feeling exists in nearly all the largest centres in Scotland as I have already stated I found to be the case in many of the distributing centres of England. The Scotch buyers are very strong on the question of having some uniform system arranged between the New Zealand producers and the principal large handlers on the Scotch markets, whereby they could depend upon a regular and constant supply of our produce. They state that owing to the fact that no uniform system of selling is followed in New Zealand by the producers, the result is that when our butter is introduced and pushed with their customers, and such customers begin to know our goods and ask for them, the merchant has no guarantee that he can procure a regular supply of any one factory's output or brand. Some of the merchants informed me that for this reason they had curtailed their trade with New Zealand.

Similar complaints to those made in Glasgow were made by the merchants in Aberdeen, Edinburgh, and Leith, and most of these merchants have to purchase second-hand through London. The Scotch merchants

expressed a desire to assist in developing trade in New Zealand dairy-produce, and are anxious to do business direct with the colony. While this is the case, they are not anxious to take all the risk by making forward purchases of factories' outputs for the whole season. These merchants are, however, prepared to make substantial advances against documents, and to handle our produce on a fair and honest consignment basis.

For a number of years our Produce Commissioner in London has been recommending to the producers in the colony the importance of adopting this system. I have already pointed out the advantages gained by producers having their goods pass through the same channel to the same market each year.

While in Scotland I had the pleasure of an interview with perhaps one of the oldest, keenest, and most successful dairy-produce dealers in the whole of Great Britain. This gentleman has carried on an extensive business in Glasgow for years, handling large quantities of produce from various countries, including Denmark, Canada, Ireland, Australia, and New Zealand. I explained to him the object of my visit. I was not there to tell him and the British importers how we should like them to run their business so as to please our producers, but solely for the purpose of getting practical information as to the best means to adopt in further improving the quality of our butter, and the general appearance of the boxes, packing, finish, branding, &c., so that we should go one step further towards suiting the tastes of the British consumers. He said he was well pleased with the quality of our butter, and our careful system of grading and the checking of weights, but did not like the method adopted by the producers of selling their butter and cheese—namely, that of trading with their produce on different markets each year. I explained that our butter was sought after by other dealers, principally Tooley Street buyers, many of whom buy the season's output at a fixed price, which price at the time seems a profitable and sure one to the farmer. He replied that this was the sore point: so long as the Tooley Street buyer is prepared to take all the risk, so long will our producers continue to transact their business in this manner. I said that the sooner we wake up to the importance of shipping our butter and cheese through reliable firms, to the same market each season, so that such firms would be in a position to supply their customers with brands which had been previously introduced, and which suited their tastes, the sooner we should narrow the margin in price which now exists between our goods and those of Denmark, and his opinion was that this was the key to the situation.

I was informed by many of the Scotch merchants that during the butter season they could always depend on regular supplies of the same brands of Danish butter, also that their customers would pay $\frac{1}{2}$ d. to $\frac{3}{4}$ d. per pound more for reliable brands of Danish, which had always given them satisfaction, in preference to having their orders supplemented by various odd brands which might be obtainable from New Zealand, and of which their customers knew little.

Some of the Scotch merchants also pointed out that it is impossible to forecast the markets, and that if they purchase the outputs straight out from a number of our large factories at the beginning of the season at a fixed price, say, from $9\frac{1}{2}$ d. to 10d. per pound, they stand to lose £8,000 to £10,000, almost as certain as they stand to make a reasonable profit on the turnover.

I submit that the arguments above mentioned are sufficiently reason-

able and sound to warrant the most serious consideration of the producers of this colony and their representatives, the National Dairy Associations. I am more and more of the opinion that if we wish to narrow the margin in the price between our butter and Danish, our producers must copy the Danes' methods of selling or consigning—namely, that of a uniform co-operative system of regular distribution on the Old Country markets.

8. OUR CHEESE ON THE SCOTCH MARKETS.

New Zealand cheese was not so often met with on the Scotch markets as New Zealand butter. The merchants in the principal centres of Scotland informed me that they preferred handling Canadian cheese, mainly because they could not depend on securing our best brands regularly.

I found that very few of our factories were shipping direct to firms in Scotland, with the result that the bulk of our cheese sold on the Scotch markets was bought second-hand through London. A few years ago Glasgow merchants carried on a fairly large trade in New Zealand cheese, most of which, I was informed, was bought direct. Now we find only a few of our factories shipping direct, and they do not ship regularly. I was pleased, however, to find one of our choice brands on the Scotch market, and this brand has been going there regularly for some seasons. The directors of this factory evidently foresaw the advantages to be gained by keeping the same brand of cheese on the tables of the same consumers constantly. This brand was found to be widely known and highly spoken of in Glasgow, and I am confident that in the event of the cheese-market taking a drop, the consumers of this brand of cheese would pay a slightly higher price for it in preference to taking a cheaper cheese in which they could not rely on getting the same uniform quality.

The argument may be used that the bulk of Canadian cheese and butter is purchased outright. I admit this to be so, but Canada being so close to the British markets, the purchases are made under entirely different circumstances. The British importers have their own buyers representing them on the various Cheese and Butter Boards throughout Canada. These buyers are in direct touch with the Home importer, even on the day that the produce is to be sold at the Board. The Home firms have in this way orders secured for so many boxes of butter and cheese that they are in a position, through their buyers in Canada, to offer a fixed price for enough of the finest quality to fill such orders. When the buyer visits the Board, no matter how anxious he may be to secure certain brands, and no matter how fine the quality may be, he often finds that the other buyers' limit prevents him from securing the goods he wants. These buyers are practical judges of quality, and the goods are purchased largely to fill forward orders. Thus it will be plainly seen that the British buyer does not take the same amount of risk in purchasing in Canada as he does in purchasing whole seasons' outputs in this colony.

A good deal of speculation has been carried on during the past few years in Montreal by firms who purchased large quantities of cheese and stored same, with the result that there have been a number of heavy failures.

I mention the above facts, from particulars obtained at Home, with a view to pointing out to our producers that the buyers, particularly on the Scotch markets, are not in the trade for the purpose of taking such risks.

9. CONDITION OF THE PACKAGES CONTAINING NEW ZEALAND DAIRY-PRODUCE.

I found the New Zealand butter-boxes to be made of more suitable timber than that of any other boxes which I saw in Great Britain. The white wood of which the boxes are made, and the neatness, cleanness, and strength of the packages are the most noticeable features of superiority in the New-Zealand-made butter-boxes. The top, sides, bottom, and also the ends of the New Zealand butter-boxes are, as a rule, made out of one piece of timber, and are not jointed or made in tongued-and-grooved parts, as is the case with some of the packages arriving in London from other countries. Then, again, the nailing of our boxes is well done, and prevents the sides or corners from springing apart when the butter is in a firm condition at the time of packing.

The Canadians are not so fortunate as we are in having such a fine timber as the New Zealand white-pine or kahikatea, out of which to make their boxes. In Canada the butter-boxes are not nailed together, but are made with what is called a "lock-joint corner," being a sort of dovetailing method by which the parts are driven or pressed together. These boxes, however, do not always remain close; for instance, when firm butter is packed hard into the corners, the boxes very often spring open in course of handling. The New-Zealand-made butter-boxes, on the other hand, remain rigid and intact when properly nailed.

Those to whom I mentioned the subject of New-Zealand-made boxes during my visit to the British markets expressed their satisfaction with the box now in use, several buyers stating that our packages were a credit to the colony, and that the general neat and clean appearance helped the sale of our butter.

In regard to the appearance of New Zealand cheese-cases when they reach the London market, I may say that these also are giving satisfaction to those handling them. Ninety-eight per cent. of the cheese-cases shipped are polygonal in shape, having twelve sides, and being almost round, so that when the cases fit the cheese nicely they make very good packages. A few of the cheese-makers require to give closer attention to this matter, as I noticed that in several of the brands too much space was left in the depth of the cases, thus allowing the cheese to move about, and also causing a waste of space in shipping. I found that some of the cheese-cases, more particularly those which have to be carried a long distance by coastal steamer, were more or less soiled when delivered from the ship at the Albert Docks; this is partly due to the excessive handling which the crates receive during transshipment, and could be avoided to some extent if cheese from the South Island was transhipped "overside" on similar lines to the way in which butter is handled from northern ports.

With the thorough and efficient supervision exercised by the Dairy staff over the handling and shipment of dairy-produce at the various ports throughout the colony, such practices as rough handling or exposure of the packages to rain or the strong rays of the sun are reduced to a minimum. I venture to say that this system of supervision is of great value in gradually improving the conditions under which butter and cheese are exported from New Zealand.

Another pleasing feature which I have to record is the use of the impressed brands on creamery butter-boxes and factory cheese-cases. I think I am safe in saying that these brands are looked upon with universal approval by those engaged in the commercial side of the dairying in-

dustry. The brands are certainly the neatest, most uniform, and attractive of any I have seen in use, for denoting the contents of the packages containing butter and cheese, anywhere throughout the United Kingdom. A few of our competitors are using impressed brands on a number of their butter and cheese cases, but the system is not adopted to any great extent by any of them. The old form of stencil-plate is still in use by many of our competitors in other countries.

The present satisfactory manner in which our dairy-products are branded is undoubtedly due to the stand the Government took in connection with the registration of brands. The system of compelling all applicants to submit to the Dairy Commissioner for approval, when applying for registration, a design of the proposed brand has been largely responsible for maintaining uniformity in the branding of our dairy-produce, and the results obtained must now be very gratifying to the owners of such registered brands.

While on the subject of brands, I may say that, after careful investigation in Great Britain, I see no reason to change my views on the branding question, which views are well known throughout New Zealand—*i.e.*, in connection with each factory using one brand only. As I have frequently pointed out, there is always an increasing demand for any good brand of butter when once that brand becomes known. The consumers are willing to pay more money for a well-known brand, and this should result in higher returns to the producers.

We have also proof of the value of the single-brand system in the high returns made by some of our larger factories which have continued to export their butter from the commencement of operations under the brand originally selected. These distinct and individual brands are familiar to those engaged in the butter trade, and are highly spoken of and recommended by the retailers. Provided, of course, that the quality of the butter is always right, there is nothing to be gained by a factory having a number of brands—indeed, the effect is quite the reverse in the majority of cases.

PACKING AND FINISH OF NEW ZEALAND BUTTER.

The packing and finish of New Zealand butter, as it opens up on the British market, are giving every satisfaction, and, from my own personal observations, leave little or nothing to be desired. For neatness and attractiveness it is equalled by few and surpassed by none of our competitors.

The majority of the New Zealand butter-boxes are lined with double parchment-paper, which prevents the butter from acquiring a woody taint, and gives the block of butter a nice appearance on being removed from the box. A better quality of parchment-paper is used in our boxes than that used in any other colonies or foreign butter-producing countries. Taking into consideration that butter exported from New Zealand has to stand the test of longer storage than that of our competitors (including the time on board ship), it is imperative that a good class of parchment-paper should be used, as anything in the way of a flimsy or cheap paper would affect the condition and probably develop mould, which would interfere with the keeping quality of the butter.

When finishing off the packages of butter in some dairying countries the method of covering the surface of the butter with a soft paste is adopted by a number of the producers; this paste is composed largely of salt, together with other ingredients. Speaking generally, the practice is not looked upon with favour, many of the retailers objecting to this

mode of packing. While in South Africa I heard a number of complaints about the use of this paste covering, and it is strongly condemned by many of those engaged in the produce trade.

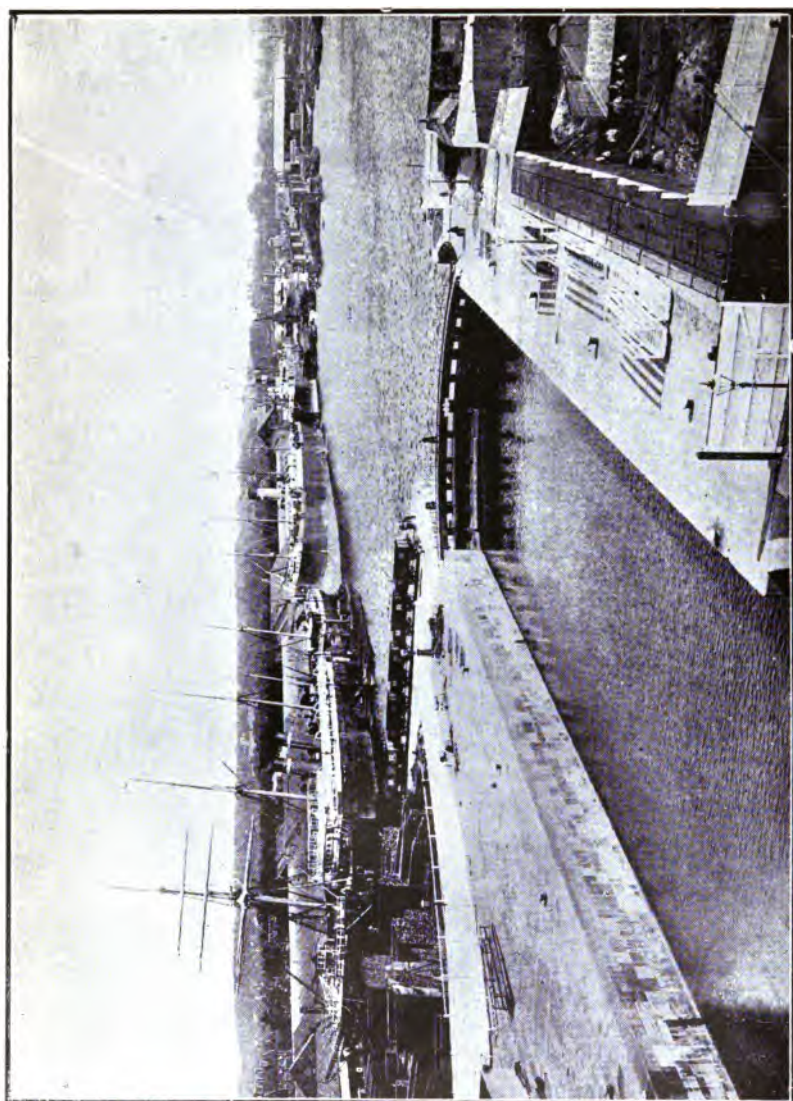
GRADE-STAMP.

Inquiries were made by me as to the estimation in which the design of the official grade-stamp, placed on each box of butter and each crate of cheese exported from the colony, is held by the British importer of dairy-produce, and I was informed that this stamp or mark is considered a very good one. Only two minor complaints were made to me on the matter; but after listening to the objections made I was satisfied that there was really no ground for complaint; in fact, the objectors freely admitted that there is much in the grade-stamp to commend itself. Many of the provision-merchants and others stated that the stamp answers the purpose very well, and contended that it is much superior to and more significant than the plain broad arrow formerly in use. Personally, I have not been altogether satisfied with the design and wording of the rubber stamp, and previous to leaving for South Africa I conducted quite a number of experiments, with a view to bringing out an improved impress grade-stamp; but I did not, however, succeed in arriving at what I considered a suitable design. However, I intend to take the matter up again, and hope to be able to submit a new process of marking the grades on butter and cheese packages.

10. SUGGESTED GRADING OF DAIRY-PRODUCE IN GREAT BRITAIN.

A number of people in the colony have advocated the sending of an official Grader to London, in order that a report could be made as to the quality of our butter when opened up on the market at Home. This matter was discussed by the Dairy Association of the South Island during the time of my former connection with the Dairy Division, when I expressed disapproval of such a step being taken. After my recent investigations in London I see no reason to change my views; in fact, I am now in a position to say that the sending of a man Home to grade the butter and cheese would be found to be entirely impracticable.

After the arrival in London of a vessel carrying New Zealand dairy-produce, as soon as a sufficient number of the various brands required for immediate delivery are sorted out, the owners or agents are in attendance to clear the produce, which is forwarded on to their customers at once. It will therefore be easily understood that a grader sent from the colony would have no chance of examining the butter, even if the firms handling it were agreeable. The owners of the butter would certainly not sanction any interference with their packages of dairy-produce at this juncture, and, even if they were agreeable, the opening of the boxes would be futile, owing to the contents being in a frozen condition. Large quantities of the butter are carted direct from the dock-sheds and distributed throughout London. When the butter is placed in the dock-sheds, each factory's brand is separated and stacked by itself. Through the courtesy of the London merchants, I was allowed to examine some of the shipments of New Zealand butter immediately after it was placed in the shed; but owing to the fact that the butter was frozen so hard that it was impossible to insert a trier, I was unable to pass any judgment on the butter. I was permitted to examine the butter in view of the official position which I occupy in connection with the dairying industry of



AVONMOUTH DOCKS AT BRISTOL.



THE DOCKS, WITH FREEZING-WORKS IN BACKGROUND, CARDIFF, ENGLAND.

this colony, but this permission would certainly not be extended to any official New Zealand Inspector in Great Britain as a legal right, especially if he wished to examine large quantities of the produce.

Immediately on arrival some of the butter and cheese is conveyed to the large warehouses of the various merchants, who are frequently awaiting its arrival in order to supply orders already received from their clients. The remainder of the cargo is placed in cool-storage.

To my mind, the only possible way which could be suggested for the grading of our produce in Great Britain would be for the New Zealand Government to acquire large storage accommodation in London and other centres, and to have all the butter consigned direct to them at these places, where the butter made from the several churnings could be picked out and examined. Besides requiring a very large number of men to undertake this work, the butter would have to be defrosted, which would entail a delay of from five to six days. The services of not less than half a dozen Graders would be required to cope with the work in a reasonable time. Even if this system were possible, there would be the danger of the produce missing a brisk market by being held for a number of days after its arrival in London. Such a scheme would, of course, never be seriously entertained by any one with a knowledge of the subject; yet there are people in this country who claim that our butter and cheese should be regraded in Great Britain.

A much simpler and more feasible way of testing the keeping quality of our butter can be adopted in the colony by grading and storing a few boxes of butter from each factory for, say, two months, and holding it under similar conditions to those of the butter shipped to Great Britain, when it could be thawed out and examined. This plan has already been tried on a small scale at the Port of Wellington—the Department having purchased some butter for the purpose—and the result in every instance has been that the Grader's judgment in the first place has been verified.

11. WEST COAST OF ENGLAND TRADE.

After returning from Ireland and Scotland, in company with Mr. H. C. Cameron I again visited Smithfield meat-markets, and paid a second visit to some of the large warehouses in Tooley Street on the 29th June, 1904. Mr. Cameron and I then left London on a hurried trip to the west coast, and although (as stated elsewhere) I had no instructions to investigate meat questions, I considered it a good opportunity to visit a few of the west-coast ports with a view to ascertaining to what extent our trade is likely to be developed with these ports. The main object of my writing briefly on this subject is more to confirm the reports already made by Mr. H. C. Cameron, particularly with regard to the great facilities and storage capacities offering at Bristol, Cardiff, and the Bute Docks (near Barry) for the handling and freezing of meat and produce.

While in Bristol and Cardiff we interviewed several merchants handling New Zealand produce, and were shown through the docks and freezing-works at the above places by the chairmen and directors of different boards, who were kind enough to arrange special yachts to take us rapidly to different and various places of interest in the harbour. In addition to enormous freezing-capacity in various works at Bristol and Cardiff, we found a very large up-to-date freezing-works at Bute, which up to that time had hardly received or stored a carcase of mutton. The various owners of freezing-works and cool-stores at these places seemed willing and anxious to do business in New Zealand produce, and a

number of them expressed their desire to enter into arrangements with our producers on what they claimed to be an entirely satisfactory basis. I mention these facts with a view to pointing out to New Zealand producers that there is an enormous cold-storage capacity available; and I may say that at the present time a large space at various ports is not being utilised. However, in face of the fact that these owners are asking for business, and are prepared to store and freeze at very reasonable rates, it seems to me that the idea of this colony erecting her own works at such ports is out of the question.

12. AYRSHIRE COWS IN SCOTLAND.

While in Scotland I saw a number of fine dairy cattle, principally Ayrshires, which are considered by Scotch people to be an excellent class of dairy cows for the purpose of making cheese. It is held by some small Scotch cheese-makers that the milk from Ayrshires produces more cheese than that from other good milk-producers. As compared with some breeds, there may be something in this contention. The butter-fat in milk from such breeds as Ayrshires, Holsteins, and Friesians is in small globules as compared with the milks of Jerseys, Guernseys, &c., and the smaller the globule, other things being equal, the less the loss in cheese-making. On the other hand, a large globule is more favourable to clean separation in the process of butter-making.

I had the pleasure of visiting the farm of Mr. Wallace, near Lochdoon, who is one of the most noted breeders of pedigreed Ayrshires in Scotland. In conversation with Mr. Wallace, he informed me that he had sold several pedigreed animals at enormously high prices. One of these animals was purchased by the Hon. S. Fisher, Minister for Agriculture for Canada, at a very high figure. This animal was taken to Canada for the purpose of improving the high-class Ayrshires which were kept at the Experimental Farm for breeding. Shortly before my visit a syndicate of English gentlemen had purchased, at a very high figure, one of Mr. Wallace's thoroughbred Ayrshire bulls, which was to be taken to the World's Fair at St. Louis. Mr. Wallace had made a study of his animals from the inception of the herd, and he knew exactly the value of each and every animal on the farm. Although portions of the herd belonging to Mr. Wallace are amongst the greatest prize-winners in England and Scotland, he has never entered one of his own animals for competition himself; and I was informed by many farmers who knew Mr. Wallace that he is recognised as one of the best judges of cattle that is to be found. Amongst the herd was a seventeen-year-old Ayrshire cow, who is the mother of perhaps more Ayrshire prize-winners than any other cow in Scotland. I have much pleasure in showing a few photos of Mr. Wallace's cattle, taken by myself at the time of my visit.

13. KILMARNOCK DAIRY SCHOOL.

While in Scotland, in company with Mr. H. C. Cameron I visited the new dairy school at Kilmarnock. I was informed that this school cost about £12,000. It was designed and built under the supervision of Professor Drummond, who is a Canadian of considerable fame as a teacher in dairying.

The building is a large one, built of solid brick, and cement-faced outside. There is also an up-to-date lecture-room, laboratory, separator, butter making and finishing room, with a large room for the purpose of



**SOME OF THE BEST-BRED AYRSHIRES IN AYRSHIRE (SCOTLAND), THE
PROPERTY OF MR. WALLACE.**



**AYRSHIRE COWS (THOROUGHBREDS), THE PROPERTY OF MR. WALLACE,
AYRSHIRE, SCOTLAND.**

1990



ONE OF THE BEST-BRED AYRSHIRE BULLS IN SCOTLAND, BRED AND OWNED
BY MR. WALLACE, KILMARNOCK, SCOTLAND



THE KILMARNOCK DAIRY SCHOOL (SCOTLAND).



A SHOP WHERE NEW ZEALAND LAMB IS SOLD, IN A SCOTCH CITY.



UNLOADING NEW ZEALAND LAMB ON A HOT DAY AT LIVERPOOL WHARF SHEDS. (NOTE SLOW SYSTEM, THE HORSES BEING TAKEN FROM THE WAGON.)

instructing cheese-makers in the latest methods of cheese-making. The building also contains a large space for the controlling of temperature for the proper curing of cheese.

This institution is situated in the centre of a splendid dairying district, or, I may say, in the midst of the home of Ayrshires. As in the case of Canadian dairy schools, it is situated in a pleasant, bright district, where there is an abundant supply of pure water, and every facility for efficient drainage. These points, as I have constantly advocated, are important when selecting a site for such an institution, for not only is it vastly important to have good drainage and a good water-supply, but it is necessary that the location be as pleasant as possible for the butter and cheese factory managers and the students. The whole place is fitted with electric light, generated by a small dynamo on the premises.

Although the school was not in session at the time of my visit, it was expected that students would be received in the course of a few months. During a long interview with Professor Drummond, I gathered that the classes conducted at this school would be on similar lines to those conducted at the Kingston and Strathroy and other similar schools in Canada.

I may point out that this school is not intended for the teaching of farmers' young sons in advanced methods of agriculture; this work is carried out at agricultural colleges. The Kilmarnock School was designed more for advancing experienced factory-managers in more up-to-date methods in the manufacture of butter and cheese, and this, in my opinion, combined with a small experimental station, is the sort of institution required in this colony.

14. THE FROZEN-MEAT INDUSTRY.

Although I wrote fully on the meat industry in the Argentine Republic, I do not feel justified in undertaking to describe the frozen-meat industry of the Mother-country, for the reason that much has already been said and written in and out of this colony by those who have had a wider experience in the meat business than I have had; and, again, for the reason that my special mission to Great Britain was to inquire into the butter and cheese industry. However, in company with Mr. H. C. Cameron, New Zealand Produce Commissioner, I had a careful look through the Smithfield markets. I also visited many of the towns in Scotland, and interviewed a large number of those handling New Zealand frozen meat, and paid particular attention to the class of shop in which our frozen meat is sold. During my visit to Scotland I took a few snapshots of some of these shops, photos of which were not obtainable, with a view to impressing on the shippers in this colony the importance of endeavouring to bring about some important changes at the other end, in the way of having meat shown and sold from a more desirable and better class of shop than that which prevails at the present time. Unfortunately, at the time of my visit it was raining nearly every day, and it was a difficult matter to secure anything like a decent photo. of any of these small shops.

At Liverpool Mr. Cameron and myself witnessed the discharge of a large cargo of New Zealand lamb from one of the steamers plying between New Zealand and Great Britain, and I was more than disappointed in the methods adopted for the discharge of our frozen lamb at such an important port as Liverpool. The meat was discharged from the ship

into a large glass-covered shed, which could not be otherwise than very warm in the hot weather. I need hardly say the methods of discharge were slow when I point out that it took such a long time to load the wagons in the shed that the horses were taken out of the wagons for some considerable time while the meat was being handled and loaded up. (See accompanying photo.)

It is well known that Mr. Cameron has for a number of years been endeavouring to impress upon shipping companies, Harbour Boards, and those interested in the consignments of frozen meat from this end the importance of having some more rapid system of discharge, and some better method of supervision of the meat from the time it leaves the freezing-chamber in the ship until it is placed in the cool-stores. In addition to this, Mr. Cameron has also drawn the attention of New Zealand shippers to the important question of the miserable or wretched little shops that the bulk of New Zealand meat is shown and sold in throughout Great Britain; and, while I have no recommendations to make with reference to this colony opening her own shops in the Old Country, I have much pleasure in supporting Mr. Cameron's recommendations on the particular lines above indicated.

With regard to the prices received at Home for New Zealand mutton and lamb, and its condition when opened up in the shops, and also of the favour it meets with, I shall leave these to Mr. Cameron, who from time to time makes special reports in detail, and who, after his longer experience in connection with these matters in the Old Country, is better qualified than I am.

15. DAIRY-FARMING IN IRELAND.

After completing my investigations on the Scotch markets, I took an opportunity of paying a hurried visit to Ireland.

On arrival in Dublin I had an interview with Sir Horace Plunket, who is the head of the Irish Agricultural Society. This gentleman received me very courteously, and spared no pains in giving me all the information necessary to bring me into touch with the Irish butter-factories which I visited in the vicinity of Limerick. I visited the agricultural schools in Dublin, but cannot say that I found anything new there or different from what I had previously seen. The experiments on the farm are conducted in almost the same manner as they are at the various farms throughout the United States, a system with which nearly all the farmers of this colony should be conversant. In connection with the college at Dublin there is an experimental station where scientific investigations connected with agriculture are carried out, particulars of which are issued from time to time in bulletin form to the farmers.

Having only a few days available to spend in Ireland, I did not have much time to make very many practical investigations in connection with the butter-factories; but I visited a few of the dairying districts in the County of Carlow, and also attended the Royal Agricultural Show at Athy. At the latter show I saw a very good collection of dairy cattle, consisting of various breeds and including a number of Kerry cows—a breed I found to predominate in some of the districts.

Naturally the farmers in New Zealand will be interested in my opinion respecting Kerry cattle, since a few have lately been imported to the colony. I made inquiries with regard to the suitability of Kerry cows in two or three of the dairying districts of Ireland, and found this breed very highly spoken of. Although not very large milkers, it was



LARGE MEAT AND BUTTER STORE, LIVERPOOL.



ONE OF THE FROZEN-MEAT SHOPS OWNED BY MESSRS. JAMES NELSON AND SONS (LIMITED) IN LIVERPOOL.



FROZEN-MEAT SHOP IN CITY ROAD, MANCHESTER, WHERE NEW ZEALAND MEAT IS SOLD.



SHOP IN PICCADILLY, MANCHESTER, ORIGINALLY OPENED BY MR. H. C. CAMERON IN 1895 FOR DEMONSTRATION, ADVERTISEMENT, AND SALE OF NEW ZEALAND PRODUCE.



FROZEN-MEAT SHOP, VICTORIA STREET, LIVERPOOL—TRADING AS THE
“FARMERS’ ASSOCIATION.”

claimed that they produce a milk containing a large percentage of fat. After carefully looking over the districts above referred to, I am strongly of the opinion that were I farming on such land myself I should be inclined to favour some other breed of cattle—that is, a cow that would give a larger quantity of milk containing possibly nearly as large a percentage of fat as the milk given by the Kerry cattle. The argument used in some countries which favour Kerry cattle is that they will live on rough land better than heavier cows; but with my knowledge of the various classes of land in this colony, I am of the opinion that a more profitable class of cows can be obtained than the Kerry; and, moreover, if land is so rough that the ordinary strong-boned milking strain of Shorthorn could not get about, I should hardly consider the land of sufficient value for dairying purposes. The main objection I have to Kerry cows is the very small udders and teats which distinguish, as a rule, this class of cattle. Holding as I do the above opinion, I feel that there is no real advantage likely to accrue to New Zealand farmers by adopting this class of cow on a large scale. At the same time, it might be wise to have a trial test of such small cattle on some of our rough land for the purpose of proving their suitability or otherwise in this country for dairying purposes.

Most of the herds which came under my notice in Ireland were small in number. The same might also be said of the factories in some of the principal dairying districts—that is to say, the supply of milk is nothing like so large as that received in the average factory of this colony.

While in the County of Limerick I visited a few of the factories in the vicinity of the City of Limerick, and also one or two near the Limerick Junction. At these factories I had the opportunity of watching the process of butter-making, which is carried out on slightly different lines from those followed in this colony. Most of the actual work connected with the preparation of cultures and the making of the starter from cultures, the ripening of the cream, and the practical part of butter-making in such small factories is carried out by dairy-maids; and, so far as I could see, this colony has nothing to learn from the Irish butter-makers.

In the City of Limerick a large condensed-milk and butter factory has been established for some years, and I took the opportunity to inspect it. After considerable trouble I succeeded in inducing the manager to show me over the premises, and, although I could see at a glance how the butter-making was carried out, I was not able to obtain any information with reference to their system of condensation of milk. From what I could gather, however, it appears that during the summer months they make provision for the storage (in steel drums or tanks) of condensed milk for foreign markets, and in the winter months, when the milk is required for filling orders, it is drawn from these air-tight tanks—or drums, as they are called—and filled into tins of various sizes, a work which is rapidly done by machinery. The condensing plant in use is similar to those used in New Zealand. Evidently a very large trade is done in condensed milk; but, unfortunately, I was unable to obtain information as to the exact output. A large local trade is also done. I was somewhat surprised to find the butter-making department of this institution so far behind the times, the machinery being obsolete, and the condition of the appliances and the premises themselves anything but satisfactory to my mind. The system of butter-making followed did not impress me favourably by any means, and I certainly thought it could be greatly improved.

I was fortunate enough before leaving for Ireland to obtain a letter of introduction to a Limerick representative of Messrs. Pearson, Rutter, and Co., possibly the largest buyers of butter in the Limerick market, and this gentleman was good enough to give me information with regard to the methods adopted in purchasing and handling Irish butter. The bulk of the butter is bought at the factories or from the factories' representatives. Each of the large dealers in England and Scotland have their agents in Ireland, who travel about the country to the various factories and purchase on the spot according to quality, making their arrangements either with the owner of the factory or the board of directors of the company, as the case may be. Rarely or never do the factories sell the whole of the season's output in advance to one buyer, as is done in this colony. I may add that a number of these travelling buyers have a good knowledge of butter-making, and during each visit they offer advice to the managers as to the manufacture of the particular class of butter which their firms can handle to advantage. This system seems to suit the Irish people, but to my mind it is not calculated to secure a uniform make of butter all over the country, for the reason that various buyers may suggest different systems of manufacture. In New Zealand it has always been my aim to secure butter of a uniformly high standard, and in order to insure this desideratum it is necessary to have all instructors working on a common basis. It must be patent to all interested in the dairy industry that if an attempt is made to cater for the varying tastes of Home dealers and consumers it will necessarily follow that no fixed standard of excellence can be attained, while if we succeed in manufacturing a uniform grade of butter of the choicest character a continuous demand will be secured.

One thing which impressed me very much in the districts I visited in Ireland was the attention given to the growing of pork. During the time I was previously connected with this Division of the Department I from time to time urged on the dairy-farmers the importance of raising more pigs, and the great help it would give to the dairy industry of the colony. I had often read about the large number of pigs raised by the Irish farmer, and the excellent bacon and hams that were shipped to England and other markets, and when in Ireland I naturally took considerable interest in the subject. I found that nearly every dairy-farmer, however small his holding, kept quite a large number of pigs, and went in for breeding high-class pigs which will produce good bacon and ham. It is a well-known fact that Irish bacon is recognised in England as probably the finest which is imported. In Ireland, as in Canada, the farmers feed the skimmed milk and whey from the factories to the pigs, the whey being sterilised before being fed. The pigs are also fattened on green stuff, such as clover and lucerne, and are topped off with corn or pea meal, with a view of producing firmness in the flesh. It was pointed out to me by people in the trade that if pigs were fed on too much cornmeal alone it would have a tendency to give the flesh a somewhat yellow colour. I had heard this statement made previously; but in the western part of the States, where thousands of acres of corn are grown, pigs are raised and fattened for the market on nothing else but corn. The Irish people believe in first building up a large frame with food such as skimmed milk and some green fodder, and afterwards topping off the pigs with solid food consisting generally of cornmeal, cracked peas, and provender. When one considers the great waste that is continually going on in the majority of our New Zealand dairy factories, one can realise that a very large amount of revenue is lost not

only to the farmer, but to the country. These remarks apply more particularly to cheese-factories, where a large quantity of the whey is usually allowed to run to waste.

While our poultry business has been receiving a great deal of attention from a number of our farmers during the past few years, I am still of opinion that if some of them—together with those who have not yet given any attention to this branch of farming—were to visit some of the holdings of their *confrères* in Ireland they would get an object-lesson which could not fail to be of considerable value. Skimmed milk is largely used there for the fattening of young birds for export. It is mixed with fine meal of various kinds, and is sometimes combined with mashed potatoes, while the whole of it is made into a porridge and fed to the birds by means of a poultry-cramming machine. Finely ground oats mixed with skimmed milk makes an excellent food.

Fattening fowls for the market by means of machinery at the first blush seems to most people a ridiculous proposition, but it is hardly more so, however, than was the hatching of chickens by means of an incubator a few years ago. The incubator has come to stay, and the chicken-feeder, although an innovation, has found a place in some of the large poultry-yards. Modern genius of recent years has affected the poultry-farm just as decidedly as it has the apiary or the stock-farm, and its problems have offered a wide field for scientific study. It is claimed that chickens fattened by machinery afford sweeter and more tender meat than those fattened in the ordinary way. Fowls are fed in this manner for two or three weeks prior to killing, and in that time increase in weight from 2 lb. to 3 lb. The chickens are not allowed exercise in this time, and are allowed no other food than that which is received from the machine. The feeding is done twice a day, and one man can feed from 250 to 300 chickens in a day. The food is forced through a tube by means of a suction pump, which is operated by a foot-pedal. The rubber tube, which is 10 in. or 12 in. in length, passes through the chicken's mouth into its crop. When the crop is full the flow of food stops instantly, and the chicken is not injured in the least. This feeding by machinery is done chiefly in the preparation of young roosters for the market, and for finishing the fattening of broilers.

Notable progress has also been made among poultry-raisers in the increased production of eggs. It is claimed to-day that it is within the power of the poultry-owner to make his hens lay an average three years' crop in two years, and that even moulting is controlled at the will of the owner. This is an important discovery in this day when the demand for eggs is so enormous and the price so high. In the last annual report of the Secretary for Agriculture, in the United States, a statement is made which gives an idea of the annual consumption of eggs in that country. This report states that the hens of the United States lay 1,666,000,000 dozens of eggs a year, the value of which in one month is enough to pay the interest of the entire national debt for one year. Undoubtedly the scientific study that has been given the subject of poultry-raising has in recent years added materially to this annual egg-production. Proper housing, for example, has come to be recognised as an absolute essential; also, as pure air is required for the healthy human being, so the well-bred fowl to-day is given plenty of fresh air, while at the same time draughts are avoided. It is not unusual now-days to see numerous small chicken-houses scattered over a large field where the poultry business is carried on extensively. This arrangement, of course, admits of the various flocks being housed separately. Arti-

ficial heat is seldom resorted to in heating these houses, except in extremely cold weather. With all its surroundings conducive, it is not unusual for one hen to lay sixteen dozen eggs in one year, and even better records than this are often made.

16. DAIRYING IN DENMARK.

During my stay in England I arranged for a hurried visit to Denmark, stopping at Copenhagen for a day or two. I had with me a few letters of introduction from the Secretary for Agriculture (Mr. Stuart Stockman) and Mr. F. B. Smith, Chief Veterinary at Pretoria, South Africa, to some of the agricultural colleges and schools in the vicinity of Copenhagen.

I arrived there at a very bad time of the year, it being the holiday season, and as a consequence found the superintendents of the colleges away from their institutions. However, I was fortunate enough to procure a number of practical facts in connection with the carrying-out of the work in the schools, and also some information from various factories which I visited in the country districts. I might mention that it is no easy matter to secure information of a reliable nature from the managers in charge of Danish butter-factories, and one does not know whether one is getting reliable information as to the precise methods followed. I am of opinion, therefore, that it would be necessary to remain in one of the large factories for some months as an assistant in order that one could acquaint one's-self with the exact methods which are adopted in the preparation of pure cultures and their use in butter-making. Notwithstanding this, I am bound to say that I received every courtesy at the hands of the various managers, and found them to be apparently only too ready to show me through their factories. When it came to the question of supplying information, however, they claimed that their time was worth money.

TESTING OF HERDS FOR BUTTER-FAT YIELDS OF INDIVIDUAL COWS.

Naturally, the question which I was most interested in while in Denmark, and one which I was seeking reliable information on, was the testing of herds for the butter-fat yields of individual cows, and I found that, with a view to improving the milk-supply, the following system, which had been started in 1893, has been very successful.

There are about 325 dairy-control societies, composed of farmers owning nearly 300,000 cows conjointly. Qualified men are engaged by these societies to spend a couple of days at intervals on each farm belonging to the members, in order to test the quality and quantity of the milk, and to calculate the cost of it as produced by each cow. By adopting this method it is easy to see that the farmer is in a position to know which cow of his herd it pays him best to keep. Experiments have proved that some herds yielded one-third more milk than others, while the butter made from the milk given by certain cows only cost 5d. per pound, as compared with that from others which cost as much as 2s. To encourage the work of these societies the Danish Government pays £25 per annum to each one having above 300 cows under its control. It is interesting to note what co-operative testing in this way has done for the Danish dairy-farmers in cheapening the cost of production.

Then again, co-operative testing associations were started in 1895. Each society is composed of farmers limited in number to from twelve

to fifteen, and these agree to have careful tests of their cows made at frequent intervals during the milking period by a competent man hired for the purpose. Records of a fairly accurate nature are thus secured not only of the yield of milk and butter-fat, but of the amount, kind, and cost of the feeds consumed. The information thus made available has proved exceedingly effective in inducing the dairy-farmers to adopt improved methods of breeding, feeding, and culling of dairy cows. At the time the first testing association was formed—as I have said, in 1895—the value of the butter exported from Denmark was less than three millions sterling. By 1901, when over three hundred of these associations had been established over the country, the value of the butter-export rose to nearly £6,000,000. This enormous increase, it is generally conceded, was for the greater part due to the work of the testing associations in weeding out the unprofitable cows. And not only was the average production of the milking-cows so largely increased, but so much additional skill in feeding was acquired that the cost of feed necessary to produce a pound of butter is now estimated to be less than two-thirds of what it was when the first co-operative association began operations. The cost of keeping the yearly records was shown by the reports of the testing societies to be from 1s. 8d. to 2s. 6d. per cow, while the increased returns per cow, as a result of five years' testing, were shown to be from £1 5s. to £3 per cow per annum. This rate of interest must be deemed to be eminently satisfactory, while the extraordinary increase in the number of the societies in Denmark proves how highly their work is appreciated. The tests made by the original associations were more than sufficient to convince the Danish farmers that formerly they were not dairying on business principles, but were allowing a lot of robber cows to eat up the profits produced by the better-class cows, and, naturally, the Danes were quick to adopt better and more profitable methods. It is but a short step from the co-operative factory to the co-operative testing association, and it would seem that methods which have proved of such great benefit in Denmark should not remain untried much longer in this country. There is at least one particularly intelligent and progressive man in every dairy community who should have little difficulty in inducing twenty or thirty of his neighbours to join with him in an enterprise that has shown such good results elsewhere.

THE SUPERVISION OF DAIRIES AND MILK-SUPPLY.

In Denmark a large number of inspectors are employed by the various associations. These inspectors, or supervisors of the work of inspecting herds, cow-byres, and the care of the raw material at the farm, are partly paid by the associations and partly by the Government. Each Inspector has his own district allotted to him—not so large as to prevent him making frequent visits—in order that he may be able to follow up his work in a systematic manner. In addition to being qualified regarding the care of milk and possessing the necessary knowledge of the construction and equipment of cow-byres, drainage, &c., many of these inspectors possess a fair knowledge of the diseases in stock; and in districts where the inspectors are not qualified in the latter respect, veterinary surgeons are called upon to make occasional visits to the various institutions or farms. I was informed in the few districts I visited that this scheme of systematic dairy-inspection has done more towards improving the quality of the milk which is delivered to the butter-factories than anything else which has been introduced in connection with the dairy industry in Denmark.

AGRICULTURAL COLLEGES.

While in this great butter-producing country I visited the large Agricultural College and Experimental Station at Copenhagen. This institution was built in 1883. It consists of several laboratories and a large experimental station. The Director is a professor of physics, and is supplied with a number of assistants, who also possess very high qualifications. Although this college was closed down at the time of my visit, I had a careful look through the institution, and noted that every facility was afforded for the carrying-out of scientific investigation in a thorough and up-to-date manner.

DAIRY INSTRUCTORS.

A large number of instructors are engaged travelling about the country giving theoretical and practical instruction at the factories, and their system of practical instruction is carried out almost identically with the system in vogue in this colony, with perhaps less coast-off work. I might mention that I was given to understand that the salaries of such instructors are paid by the State.

PURE CULTURES AND STARTERS.

The question of starters I was naturally very much interested in, seeing that I was largely responsible for introducing the system of home-prepared starters into New Zealand factories. I found that commercial starters were used in the majority of factories, and appeared to be giving general satisfaction. But while this is true, I also found that two large factories had been using starters prepared from home-made cultures from sterilised skim-milk, and I was informed that one of the factories using this home-prepared starter had taken the prizes at the Royal Show for three years in succession. The method of preparation, strange to say, was almost identical with that described in Bulletin No. 1 issued by myself and distributed by the Dairying Division in this country a few years ago.

It may be well to point out while on this subject that commercial starters can be procured at a very reasonable cost from the experimental stations in Denmark; and, in addition to that, they are always found to be new and fresh, instead of being—as we very often receive them from abroad—three months old.

BUTTER COMPETITIONS.

Every year several large Agricultural and Butter Competition Shows are held throughout the country. These exhibitions are liberally patronised by the majority of factory-managers, and a keen interest is displayed on the part of the managers in these shows. In my opinion, such shows are of the greatest value from an educational point of view.

SIZE OF DAIRY HERDS.

While in the country districts of Denmark I was delighted to see the methods adopted for milking the cows. Nearly all of the herds which I inspected were milked in the paddocks. The cows are staked in a straight line across the paddock, which, as a rule, contains green feed—either clover, timothy, or lucerne. The cow is tied by means of a small rope around the horns or the neck, and fastened to a short stake which is driven solidly into the ground. The ropes only permit of the cow eating for a certain distance into the green feed, and in this manner there is practically no waste of fodder. In this colony, if I even suggested the



A LARGE AGRICULTURAL COLLEGE, COPENHAGEN, DENMARK.



AGRICULTURAL COLLEGE, DENMARK.

advisability of adopting similar methods, people would no doubt immediately say that it would be absolutely unworkable, for the reason that the soil is much softer—particularly in such districts as Taranaki—and that the herds are much larger. While that opinion may be held by our dairy-farmers, it may surprise them to know that I have seen herds—of which there are a good few in Denmark—numbering six and seven hundred cows. I think there are many things which commend this system of feeding and milking to farmers in other parts of the world. Apart from the fact that the food is not wasted, the manure is evenly distributed over the land, and, as the cows are moved 4 ft. or 5 ft. each time, the milkers are, as it were, always carrying out the work on clean short grass.

The milk is collected by means of small hand-carts, which have the cans suspended between the wheels. On top of each can is placed a combined strainer and aerator. Many of these aerators are of the improved style, having a set of double discs containing cotton-wool, which acts as a filter for the milk. While there are some very large herds, there are at the same time many smaller ones ranging from ten to forty cows each; and I might mention that the cooling of the milk is preferred to aeration in many parts of Denmark.

METHODS OF SELLING BUTTER IN DENMARK.

The bulk of the Danish butter is shipped to England twice a week, after being passed by a committee or society which has its headquarters at Copenhagen, and which is composed of three buyers, two factory-managers, a couple of dairy experts, and others. The butter, as a rule, requires a period of nine or ten days before it is placed on the counters in England. An excellent system of ascertaining the keeping qualities of the butter is carried out by the various societies and co-operative companies in connection with the experimental station at Copenhagen. Sample boxes of butter out of regular shipments from each factory are forwarded to this central station and stored for ten days, or about the length of time required for the delivery of the butter on whatever market it is shipped to. The butter is then examined by a committee of experts, and reports forwarded to each factory. This work seems to be proving of great value to the factory-managers throughout Denmark. Fairly large quantities of fresh butter put up in rolls are shipped to Paris, where it obtains a ready sale. It is needless for me to say that the Danes ship their butter through the same channels regularly to British markets. I have dealt with this matter, however, at length elsewhere in this report.

PRESERVATIVES IN BUTTER.

I was informed by some of the factory-managers and experts that no preservative of any sort was used in butter for export, and that every factory is liable to a heavy penalty for using boracic acid or preservatives of any kind. While this may be true, I was informed, on the other hand, that small quantities of boracic acid are used in a few of the Danish factories.

PASTEURISATION.

Although pasteurisation of the whole milk or skim is not carried out in all factories, it is compulsory by law that all skimmed milk returned to the suppliers from both private and co-operative factories must be pasteurised, or, rather, heated up to 185° Fahr. In order that this work may be carried out in a thorough manner, and that no disease may be conveyed through the skimmed milk to the stock, the inspectors

employed by the various associations visit the factories from time to time for the purpose of seeing that the law is obeyed in this respect.

PRICE OF LAND.

Very good land can be obtained at from £20 to £35 an acre—rarely ever does it exceed the latter price. Farm labour is plentiful at about 2s. 6d. per day, including board.

DAIRY SCHOOLS.

There are not a very large number of dairy schools in Denmark, but they are situated in the centre of good dairying districts, and in themselves are very large buildings. The attendance at these schools during the winter—covering a period of from five to six months—is correspondingly large. A dairy factory is connected with each of these schools, where a supply of milk is received in order that practical instruction as well as the science of dairying may be imparted. The young sons of farmers are generally taught initially at the agricultural colleges and afterwards sent to these dairy schools, some of which are privately owned and subsidised by the State. The pupils reside at the schools during the winter course, and those who pass the annual examinations receive a diploma of proficiency, which assists them to obtain positions as factory-managers.

THE BREEDS OF DAIRY COWS.

The most noticeable breed that came under my view was the native or Red Danish cow, with a few herds of the Jutland type. I also saw a few good pure Jersey herds. The Red Danish cows are said to be excellent milkers, and those people with whom I conversed claimed that the yield of butter-fat was fairly high. I was also informed that the average production per cow for a season ranged from 800 to 1,000 gallons of milk.

TESTING OF MILK AT FACTORIES.

As this is a burning question in parts of New Zealand, I made special inquiries as to how the work was carried out in Denmark, with the result that I found that it was nearly all intrusted to the managers in charge of the various co-operative factories. So far as I could ascertain, the State does not control the testing of the producers' milk at the factories, although it largely controls or assists in the testing of individual cows in the various herds throughout Denmark.

INSPECTION AND GRADING OF BUTTER.

The grading or inspecting of butter is not carried out in such a systematic manner as it is in this colony. The method of procedure in Denmark is that on certain days in each week a sample box is collected from all factories, which is judged and pointed by a dairy expert. I was given to understand that this system worked well.

WATER-SUPPLY AT FACTORIES.

I made inquiries with regard to the purity of the average water used at butter-factories throughout Denmark, and from the reports supplied to me by those connected with the industry I learned that very little difficulty was experienced in this respect. I was informed that in years past trouble had been caused by the deterioration of the butter in consequence of the use of impure water, but that this was overcome by filtration. The same trouble is experienced with the filtering of water in Denmark as has been met with here—viz., that of procuring filters sufficiently large and efficient to cope with the large volume of water generally used in factories.



AN OLD STYLE OF WINDMILL FOR PUMPING WATER AND CUTTING FEED ON
THE FARM, DENMARK.

SEPTIC TANK.

This is a question on which I was in hopes of getting some information; but I was informed that numerous experiments had been carried out with the sewage-water from butter-factories, and that such experiments had not been successful.

TEMPERATURES OF BUTTER SHIPPED TO ENGLAND.

Although I did not have an opportunity of personally examining any of the Danish butter in the freezing-chambers of the steamers, I was informed on good authority that all the factory-butter shipped to England was carried at a much lower temperature than is the butter from this colony—namely, approximating to zero.

17. A NEW SYSTEM OF HIGH-PRESSURE STERILISATION OF MILK.

When visiting Denmark with the object of picking up some new points in connection with the dairy industry, I was given the opportunity of examining a new machine—a patent milk-steriliser—specially designed to treat milk for city supply on a large scale.

This machine is an elaborately built one, and mainly consists of a series of steam-tight jacketed cylinders, which are fitted with the necessary pumps, steam-gauges, &c. The milk is heated under pressure to a very high temperature. The cylinders are enamelled on the inside surface where the milk comes in direct contact with the vessels, and the flavour of the milk appears to be in no way impaired. The milk passes on to a cooling apparatus direct from the heaters, without being exposed to the atmosphere, and is cooled under cover instead of by the usual open-air system. In fact, the milk is not exposed to the air at any stage in the process; therefore it may be said that the milk is absolutely sterile when bottled—at least, that is the claim made by the inventor. A bottle of milk treated by this patent sterilising-machine was given to me, and, although it was said to have been bottled for twelve months, it showed no signs of coagulation, and was found to be sound in flavour.

It has for years past been the object of scientific men and others interested in the supply of milk to cities to obtain milk in a perfectly uninfected or absolutely pure state, and to be able to bring it to the market from distant places, where it can be produced cheaper than in the immediate vicinity of large towns. This matter is of the greatest economical and sanitary importance both to the distant suppliers of milk to the towns and also to the consumers. It is claimed that this new process makes it possible to bring the milk considerable distances. In the past many exhaustive experiments have been made by investigators to devise means of obtaining a pure supply of milk. It is well known that deterioration of the milk invariably takes place after it has been drawn from the cow and before it reaches the consumer. This contamination is due to the numerous germs which gain access to the milk by being carried on dust-particles in the air. The first thing, then, from a scientific standpoint, would be to destroy these germs.

This destruction can only be done in two ways—viz., killing the germs by the application of heat, or by adding chemical ingredients; but the latter is dangerous to health, and is consequently prohibited by law. Therefore the heating of the milk is the one and only way out of the difficulty. In order to destroy these germs the temperature must be raised to a very high point, even up to 270°. By heating the milk so

far beyond the boiling-point, or even to a much lower temperature, it becomes scorched, and a cooked flavour is developed which is disagreeable to the taste. The digestibility of the milk is also impaired; but with the new process mentioned above this difficulty has evidently been overcome.

Many dairymen and milk-vendors have tried a partial pasteurisation of the milk—that is, heating it to a lower degree; but this treatment does not hinder the growth of the deleterious germs so completely as is desired. Attempts have been made to improve the condition of the milk delivered to consumers by freezing it before transport. It is a well-known fact, however, that the freezing of milk does not destroy the germ-life it contains, but simply retards the development of bacteria. Then, again, milk which has been once frozen deteriorates much quicker after it is thawed out than ordinary fresh milk.

Six or seven years ago the inventor of the sterilising plant above referred to got the first idea while studying the growth of bacteria in milk at his laboratory. After two years of experimenting the result was laid before some of the leading scientific men in Europe, and attracted a great deal of attention. The invention of this machine makes it appear that the placing of a pure milk on the market is within sight, and if the process fulfils expectations it will make a revolution in the supply of milk to cities and towns.

18. COOL-CURING AND COLD-CURING OF CHEESE.

The question of the cool-curing of cheese has in some places been misunderstood, and "cool-curing" has been confused with "cold-curing." When the system of cool-curing was first talked of in Canada and the United States, it was thought by some writers and cheese-makers in this colony that it necessitated the holding of the cheese at a temperature of 40° Fahr. or below. I shall here endeavour to explain the difference between "cool-curing" and "cold-curing."

The latter would mean the holding of the cheese in the curing-room at a temperature of 40° Fahr. for six or eight weeks. This system, in my mind, is out of the question in New Zealand for the following reasons, viz.: First, it would be necessary to provide for enormously large curing-rooms in order to furnish sufficient space for the cheese; second, there would be a large consumption of fuel, thereby increasing the expenses for refrigeration to such an extent that any improvement in the quality of the cheese might not compensate for the extra cost and the additional time and labour necessary; third, the suppliers would have to wait longer for their dividends, owing to the extra time required for cold-curing. The producers could not afford to stand out of their money for such a length of time, even though the cheese was improved in quality by curing at such a low temperature.

While making the above statements I wish it understood that excellent results have been obtained from experiments carried out by Professors Dean, Van Slyke, Russell, and Babcock by curing cheese at a temperature of 40° Fahr., and in many cases where cheese were cured at a much lower temperature a superior quality was obtained. There are, however, as above pointed out, many difficulties in the way of cold-curing being carried out in connection with our factory system.

In defining the system of cool-curing as compared with cold-curing, Professor Ruddick makes the following statements: "If I may be allowed to draw a line of division, I would say that all cheese cured at



ONE OF DENMARK'S LARGEST BUTTER-FACTORIES, "TRIFOLIUM," HASLEV, DENMARK.



A COW-STABLE WITH SOD ROOF, DENMARK.

a temperature below 50° Fahr. might be called 'cold-cured,' in order to distinguish them from those cured at temperatures ranging from 50° to 60° Fahr., which can be more properly described as cool-cured cheese. At first sight," he says, "this may appear like making a distinction without a difference, but if we examine the question carefully we shall find that there is a sufficient reason for making the two classes."

Cool-curing, according to the experience gained at the Canadian Government's cool-curing stations, and also at many factories where the system of controlling temperatures has been adopted, means curing at a temperature of from 55° to 60° Fahr. Cheese cured at a temperature of 55° would require about two weeks longer to cure than cheese held at temperatures ranging from 75° to 80° Fahr., and cured in poorly constructed or uncontrolled curing-rooms.

During my visit to England and Scotland, where some of the finest cheese in the world is made, I found that rarely ever does the temperature of the ordinary curing-room go above 60° or 62° Fahr. I wish to point out that the object of the Dairying Branch of the Department of Agriculture in Canada in establishing the central experimental cool-curing stations was to convince the manufacturers of the importance of curing their cheese at a uniform temperature, or at nearly the same temperature which Nature provides in nearly every district where fine cheese is made in England and Scotland. In many parts of Scotland the cheese are cured in brick and stone buildings, which are much cooler than many of our poorly constructed wooden buildings. I have also seen cheese cured in the basements of such buildings, but there is always a danger of the growth of mould becoming a serious difficulty when cheese are cured in such places.

The Scotch cheese are, however, handled differently in the process of manufacture. Their method of bandaging the cheese tends to prevent mould from attacking the surface of the cheese. The system adopted in many factories, when it is found difficult to secure a smooth tough rind, is to plunge the cheese into a tank of clean hot water, and allow it to remain there for a few seconds. This treatment tends to give a better rind, and allows the bandages to knit into the surface of the cheese, thus preventing them from cracking. Many of the Scotch makers claim that the method of applying warm water to the rind of the cheese is not sufficiently effective. All this is done at the time of the bandaging. In all small cheese-factories in Scotland, which are, as a rule, operated by private enterprise, the cheese are bandaged with strong cotton, which is cut or torn into narrow strips about 2½ in. in width, and wrapped tightly round the cheese, beginning at one end and overlapping about ½ in. as the cotton is bound around the cheese. There is quite an art in bandaging a cheese properly in this manner. One point in its favour is that it keeps the cheese in its natural shape much better than our thin loose cheese-cloth or bandage does. It has also a tendency to prevent mould from attacking the rind or penetrating into the cheese. When the cheese are ready for shipment, they are covered with cheap cotton or rough canvas covers to prevent them from getting soiled or dirty on the way to the markets. These cheese present a neat, clean appearance when placed on the counter after the rough covering is removed. Most of the Scotch makers do not allow the cheese to leave their factories until the cheese are properly cured, and our New Zealand factories could well take a lesson from the Scotch people in this respect.

Some people in this colony are sceptical as to whether the system of controlling temperatures in our curing-rooms, which means, putting it

plainly, cool-curing, would pay for the outlay necessary to improve the buildings. From what I have seen in Canada, and also from the information which I have to hand regarding experiments carried out in the United States, I have no hesitation in saying that the saving in shrinkage and improvement which would result in the quality, flavour, body, and texture would in a couple of seasons more than pay for the outlay required to improve the curing-rooms in our factories. Our dairy companies must also take into consideration the important question of improving the reputation of their brands, which would undoubtedly be the result if a uniformly well-made cheese, cured in properly controlled curing-rooms, were supplied to the same customers on the British market each season.

The proper temperature for curing cheese which are required to be shipped regularly to the British markets is from 55° to 60° Fahr. as above stated. It only requires about a week or two longer at a temperature such as this to cure cheese to that stage which is known as "breaking-down" than it does to cure cheese in uncontrolled curing-rooms at temperatures ranging from 70° to 80° Fahr.

Experiments have been carried out on an extensive scale by the dairying service in Canada, where various samples of cheese from the same curd, but cured at different temperatures, were submitted to various buyers and experts. The latter pronounced the cool-cured cheese to be far superior in quality to those which were cured at the ordinary temperatures. The difference in value was, in many cases, placed as high as 1 cent, or $\frac{1}{2}$ d. per pound, of cheese.

SAVING IN SHRINKAGE.

Apart from the improvement in the quality of the cheese, the question of shrinkage is one which must be reckoned with by the producer. From all the experiments carried out in the United States and Canada, it has been proved beyond a doubt that the great saving which is brought about by cool-curing would of itself soon repay the ordinary cheese-factory for the cost of improving their rooms. Detailed tables of the saving in shrinkage at the four consolidated curing-rooms in Canada have been prepared by the Dominion Department of Agriculture. These tables being lengthy, space will not permit of publishing.

SYSTEM OF COOLING THE ROOMS.

The system of utilising the cooling-power of natural ice has been proved a success in Canada. The ice can be stored so cheaply during the winter months, and the system is so simple and effective, that the probability is that most of the ordinary-sized factories will adopt this method of controlling the temperature in their curing-rooms.

MECHANICAL REFRIGERATION.

In this colony, of course, it will be necessary to adopt the mechanical-refrigeration system. At the Cowansville and Woodstock Consolidated Curing-rooms, in Canada, the brine-tank system was installed. This plan was adopted not only for the purpose of cooling, but also on account of the advantage of being able to store a reserve of cooling-power. After one season's experiments it was found that owing to the sluggish circulation of the cold air, the relative humidity was so high that it was impossible to keep the cheese from contracting mould. The next season the tank system was substituted, with expansion-coils placed over a brine-tank, which was insulated in a small chamber, from which the cold air

was forced out by means of a fan. The cold air is now circulated through the curing-rooms by means of a system of ducts, and the warm air is brought back to the fan. As the brine flows over the coils, and as the air is forced through them, the air is chilled, dried, and purified.

INSULATION AND CONCRETE FLOORS.

It is important to insulate the walls and ceiling of the curing-room, and to arrange strong bevelled-edge insulated doors so as to prevent the hot air from flowing in and the cold air from escaping. A concrete floor is also necessary. Concrete being a good conductor of heat, and lying as it does on the ground, its surface has a constant temperature derived from the low degree of heat in the earth of 50° to 55° Fahr., according to the locality and the character of the soil underneath. Concrete having the qualities above mentioned, it is not difficult to maintain a temperature of from 55° to 60° Fahr. if the building is thoroughly insulated and the installation properly carried out. The curing-room portion of the buildings, where the cool-curing is carried out in Canada, is 3 ft. below the level of the making-room. It is claimed that by this arrangement the cost of maintaining the necessary temperature is much less, both where artificial- and natural-ice methods are adopted.

HIGH TEMPERATURES.

Although the temperature of the ordinary curing-rooms in New Zealand is not so high as it is in Canada, there are times during the hot summer months when our cheese are heated on the shelves to such an extent that the quality is seriously injured. When the temperature goes up to 74° or 75° the fat exudes from the cheese, and it is claimed that after the temperature goes above 60° the quality is slightly injured. In the South Island, of course, the temperature does not range so high as it does in the Auckland Province, yet even in the South we often find the temperature go as high as 70°. Instructors reporting from the Auckland Province have stated they found the temperature in some of the curing-rooms exceeding 80° Fahr. Now, any practical cheese-maker knows, or should know, that such treatment, even of a well-made cheese, almost ruins it in quality. High temperature causes the cheese to go "off" in flavour more rapidly, and the cheese also acquires a sharp, nasty taste to the palate, which is disliked by the Home buyers. Another point is, that when cheese are held at high temperatures they are found to have a rough, mealy texture. When once the butter-oil is started in the curing process, serious deterioration takes place in the quality of the cheese, and the shrinkage is also bound to be greater. "Cool-curing," as Professor Ruddick says, "will not make a fine cheese out of a poor one, but weak, open, or acid cheese are slightly improved and show up better when cool-cured than when cured in ordinary hot curing-rooms."

COOL-CURED CHEESE IN GREAT BRITAIN.

Apart from my inquiries in Canada with reference to the quality of cool-cured cheese, I made special inquiries on my visit to London and the Scotch markets, where thousands of Canadian cheese are sold, and in almost every case the purchaser claimed that the cool-cured cheese were far superior to those made from the same curd but cured under the ordinary conditions. The difference in value was placed by some buyers at between $\frac{1}{4}$ d. and $\frac{1}{2}$ d. per pound.

19. COOL-CURING OF CHEESE IN CANADA.

Before leaving London for New Zealand I received instructions through the Agent-General from the Secretary for Agriculture at Wellington to visit Canada, for the purpose of obtaining some reliable information in connection with the cool-curing and paraffining of cheese in that country.

During my visit to Canada I visited two of the central experimental cool-curing stations established by the Dominion Government. The first one visited was at Cowansville, where a large number of cheese belonging to the suppliers in that district were cured. The then Acting-Dairy Commissioner, Professor J. A. Ruddick, accompanied me to this experimental station, and carefully explained the working of the whole institution.

At this central experimental station the temperature is controlled by mechanical refrigeration, which I will endeavour to explain later on. They have also a large experimental station, fitted with refrigerating machinery, in Western Ontario, at the great cheese centre of Woodstock, near Ingersoll, where I believe the first Canadian Cheddar cheese was manufactured on the factory system. At the Brockville cool-curing station, which I visited in company with Mr. Ruddick, the ice system is employed, and also at St. Hyacinthe, in the Province of Quebec, the same system is in vogue.

Before giving particulars with reference to the practical carrying-out of the work of cool-curing and paraffining of the cheese, I beg to point out that, in my opinion, many of the people in New Zealand have a wrong impression as to the Canadian Government's main object in establishing these cool-curing rooms. Some people have remarked that they do not think it would pay to have these central stations established in any country, owing to the cost of carting the cheese to such centres. I may point out, however, that the object of the Canadian Government was to provide a practical working illustration on a sufficiently large scale to attract the general attention of all those engaged in the Canadian cheese industry. When the scheme was first formulated by Professor Robertson, then Commissioner for Agriculture and Dairying, and Professor Ruddick, Chief of the Dairy Division, Parliament was asked to vote a sum of money for the purpose of constructing four large central or consolidated cool-curing rooms. These were situated at Woodstock and Brockville, in Ontario, and at St. Hyacinthe and Cowansville, in the Province of Quebec. The establishment of these central curing-rooms proved that a great saving could be effected in shrinkage under the new system, and that a higher price could be obtained for the cheese owing to **the great improvement brought about by curing at a uniformly low temperature.** So successful were these practical illustrations that a large number of the factories throughout Canada decided to make great improvements in their own curing-rooms. The one drawback which I saw when in Canada, and which may stand in the way of all the factories going in for cool-curing, is the fact that the majority of the factories are run by private enterprise. Under the Canadian system of factory-dairying, the man who owns the factory does not get the benefit of the increased price which results from the improvement in quality and the large saving in shrinkage—the supplier and the purchaser are the people who reap the benefit. So it has been suggested by Professor Ruddick that the factory-suppliers and the buyers of the cheese should assist the proprietors of the factories in improving their curing-rooms. If this

arrangement could not be carried out, I consider that the suppliers would only be treating the manufacturer fairly by allowing him an increased price for the manufacture of the cheese for one or two seasons, in order to assist in covering the cost of improving the curing-room. From what I saw whilst in Canada, I think that the general adoption of cool-curing, or rather the curing of the cheese at a uniformly low temperature, will do more good for the Canadian cheese industry than any improvements which have been advocated in the past. Of course, the question of dairy-inspection and the necessity of getting the raw material delivered to the factories in better condition are also most important matters which must not be overlooked. The Dairy Commissioner for the Dominion is now moving in the direction of bringing about the desired improvement in connection with cow-byres, care of milk, &c.

I have long since advocated a system of dairy-inspection in this colony, which could be carried out on a thorough and systematic basis. We have now reached such a high standard, so far as the quality of our butter and cheese is concerned, that our work of coat-off instruction at factories will in the future not have such a telling effect, because it is impossible for any expert to make a choice article of either butter or cheese out of inferior milk. My contention, therefore, is that we must move at the earliest possible date in the direction of improving the raw material. I may here explain that in many parts of Canada syndicates comprising a number of cheese-factories are formed and an instructor is appointed to undertake the work of instruction amongst the factories in each district. This instructor visits the various factories at intervals throughout the whole season, meeting owners of private factories, boards of directors of co-operative concerns, giving instruction at the factories, offering suggestions with regard to improvement, and urging upon the manufacturers and suppliers the importance of improving their curing-rooms, so that the cheese can be uniformly cured. In this way, where the instructor has not too large an extent of country to cover, he is able during the slack time to do a great deal of good work amongst the suppliers in the way of educating them in the latest methods in connection with the care and cooling of the milk, and he also endeavours to get all suppliers to improve their cow-stables and milking-yards. In New Zealand, although we have a small country, yet it is impossible that the small staff of men at present connected with the Dairy Division could undertake much work in the way of instruction or educating the suppliers at the farms. It is to be hoped, however, that we shall soon have a better system of dairy-inspection, and that vast improvement will be brought about in connection with the raw material.

20. PARAFFINING OF CHEESE.

While in Great Britain I made careful inquiries with regard to the cheese from Canada which had been paraffined at the Government consolidated curing-rooms. I had the pleasure of seeing samples of Canadian paraffined cheese in London, particularly in the Tooley Street warehouses, and also on a few grocers' counters. Again, when I visited the Scotch markets, I examined a number of paraffined cheese and interviewed several of the importers of such cheese, and also got the opinions of a few of the Scotch grocers on the same. Like the cool-curing of cheese, paraffining is something new, and, in my opinion, it will take some time to get the people accustomed to it. The principal objection to paraffined cheese seemed to be from the grocers. Most of them complained of the

cheese shrinking much more than the ordinary cheese which had not been paraffined. Many of the grocers informed me that once the cheese were cut up on the counter the shrinkage was more than double that of the ordinary cheese. I was, however, not able to find any grocer who had carried out an accurate test, or who could tell me the exact amount of shrinkage, or any person who had made a trial test between a paraffined cheese and an ordinary unparaffined Cheddar. Other grocers were suspicious that the cheese were not genuine, owing to the rind being so much smoother and softer than the ordinary tough-rind cheese. A few of the dealers went so far as to say that they believed these cheese were adulterated, and they were suspicious of the presence of margarine. In speaking to many of the merchants to whom the cheese were shipped direct from the consolidated curing-rooms in Canada, they spoke very highly of the paraffined cheese. The main points in their favour is the neat appearance of the cheese, the nice smooth velvety rinds, and the good flavour which the bulk of the paraffined cheese possess. Although, as above stated, fault was found with the cheese by some of the grocers, my opinion is that in time, when the people become educated to the effect of the paraffining on cheese, these little complaints will disappear.

After getting all the particulars I could on the question of paraffined cheese in Great Britain, I went into the matter with Professor Ruddick when I arrived in Canada, and he threw some valuable light on the question of the shrinkage of paraffined cheese. He stated that several experiments were made in Canada, where cool-cured cheese from the same vat as those which were paraffined were cut up and exposed for a length of time, and the difference in shrinkage between the two cheese was found to be very small indeed.

Another point which Professor Ruddick threw some light on was that of the amount of paraffin-wax which the ordinary paraffined cheese was covered with. It had been stated to me that some Canadian paraffined cheese were received on the Scotch markets with as much as 1 lb. of paraffined-wax on each one. After going into this question with Mr. Ruddick and others interested in the paraffining of cheese in the Canadian factories, I found that rarely ever does the weight of the paraffining on the whole surface of the cheese exceed 4 oz. It might happen, of course, in a small factory, where the manager is not in a position to carry out the whole process as it should be carried out with regard to the temperature of the wax and the length of time during which the cheese are held in the hot wax, that some of the cheese should be covered with an extra quantity of the wax, but where the proper system is carried out this difficulty would not arise.

It is claimed by those in charge of the large consolidated curing-rooms that in order to get a nice thin coating of the paraffin-wax all over the surface of the cheese it is necessary to have the temperature of the wax at 205° or 210°, and to allow the cheese to remain in the paraffin from ten to fifteen seconds.

21. ADVANCEMENT OF AGRICULTURE AND DAIRYING IN CANADA.

After being away from Canada for nearly five years, I was amazed to find the great strides which had taken place in the direction of improved methods in the carrying-on of nearly all work in connection with agricultural pursuits. Each year greater energy and more skill is being applied towards cheapening the cost of production and improving the quality of the farm-products.

In agriculture, improved methods of cultivation are very marked. Mixed farming is becoming more general, even in the great wheat-belts of Manitoba. The farmers have become alive to the fact that by going on for years continuously cropping the land with wheat and other cereals the soil becomes gradually exhausted. The carrying of more stock on the farms, or rather combining dairying with grain-growing, enables the farmer to return more plant-food to the soil in the form of manure. This lesson might be copied with beneficial results in some of our purely wheat-growing districts in New Zealand, particularly in parts of Canterbury.

SELECTION OF SEEDS.

While a great deal has been done by better cultivation of the soil and fertilising, much more has been accomplished just recently by the careful selection of seeds—that is to say, as far as more scientific farming is concerned. A good deal has been done at experimental stations to ascertain the most profitable varieties for farmers to grow, and good results have been produced by introducing good varieties. The level-headed thinking farmer, however, is not satisfied with slight improvement, but is anxious to continue improving. Many farmers think that if they have a good variety of seed this is all that is required. This is a mistaken idea according to many of the most scientific farmers in Canada. It is claimed that even with a high-class variety you cannot rely upon it retaining its original value without careful selection of the seed from year to year. The whole question of the selection of seed-grain seems to me to be in the most careful discrimination between superior and inferior grain.

A large number of experiments were conducted at the Guelph (Ontario) Agricultural College for from five to nine years, and I beg to quote briefly from a report by Professor C. A. Zavitz: "Selections were made from spring wheat, barley, oats, and peas. These selections were made from fresh seed grown in large fields each year. The method adopted was to secure an equal number of large plump and small plump seeds of each variety or kind of grain. Taking the average results of the four classes of grain, it was found that the large plump seed produced 5.3 bushels more per acre than the small plump grain. The most marked difference in the results of the two selections of seeds was found in the experiments with oats, the large plump seed producing nearly 12 bushels per acre more than the small plump seed. Many other exhaustive experiments were carried out along different lines, including selections of large plump, small plump, and shrunken seeds. One of the main objects of such experiments was to find out the influence on the comparative size of the seed produced after continuous selection along a definite line. As a result of such experiments it was found that in all cases the yield from the large plump seed was considerably larger than the yields from the other classes of seed. It was also definitely proved that in the case of peas and winter wheat, split seed was decidedly inferior to the selected plump grains for seeding purposes. Many farmers in the Northern States have greatly increased the yields of their corn-fields by careful selection. In the case of sugar-beets the same may be said. The percentage of sugar in the juice of the roots has been greatly increased. In some cases it was found that by right scientific methods the increase was nearly 200 per cent."

In an address given before the Farmers' Institute meeting in 1904. Mr. Leonard M. Newman, of Ottawa, wisely points out that in careful

field selection we have the advantage of having a larger number of plants to select from, and we have the advantage of knowing the plant itself, which is of prime importance. He further states that in order to procure the best results we must select from the most healthy and vigorous plants those which have produced superior heads having the largest number of spikelets—in fact, the careful breeder has numerous things to watch. He must have a clear idea of what he wishes to secure; for example, he may not only wish to keep up the yield, but also to develop a stronger-strawed variety out of a weaker one. Whatever be the characteristics he is after, he must select from those plants which show these in a more marked degree than those which surround them.

Perhaps no living man has done more towards advancing agriculture and dairying in Canada than Professor J. W. Robertson, late Commissioner of Agriculture and Dairying for the Dominion Government. For a number of years past he has been making a careful study of the selection of seeds. He has also proved by practical experiments at the Government experimental and private farms that many thousands of dollars could be added to Canada's grain-production by adopting his well-thought-out and practical scheme of seed-selection.

The possibilities of Professor Robertson's method of improving Canada's cereals were seen to be so wonderful that in 1900 Sir William MacDonald, of Montreal, gave over \$10,000 to be distributed to boys and girls on the Canadian farms in the form of prizes. This was done to encourage the children to carefully observe and study the benefits to be derived from making for themselves a systematic selection of seed-grain year after year. The competition covered a period of over three years, and so marvellous were the results that an association, called the MacDonald Robertson Seed-growers' Association, was formed with a view to further encouraging the production and general use of seed of superior quality for the raising of farm crops. The Dominion Government has recognised the value of this important work to such an extent that it now grants sufficient money to the association to enable it to carry on the work exhaustively and effectively.

Mr. Newman, in his address already referred to, states that it is not too much to hope that most of their economic plants can be made 25 per cent. more valuable than they are at present. He further adds that the Province of Ontario alone produces 110,000,000 bushels of oats annually. Now, if this crop be valued at 30 cents per bushel, it would mean \$33,000,000 to the province. If, on the other hand, careful selection was followed, and none but high-classed seed was used, this careful breeding—just as in breeding up a good herd of cattle—would mean, taking for a basis 25 per cent. more of a yield, about 25,000,000 bushels to this one province, and this at the same price would mean an increase of nearly \$8,000,000 for oats in one province alone.

22. EXPERIMENTAL FARMS.

It is thought by many people in this colony that experimental farms should be run and worked at a profit. I have repeatedly heard it stated that the experimental farms at Waerenga, Ruakura, Levin, Momohaki, and other places do not pay. That contention may be met by pointing out that hardly ever do we find any class of education successfully and effectually carried on at a profit to the State, whether it be the educating of young children, or of the farmer to newer and cheaper methods of producing on the land. The above being so, I beg to point out briefly a

few of the many things which Canada is doing to assist the farmer in the way of educating him how he can produce more at a smaller cost.

Canada to-day possesses five main experimental farms—

- (1.) The Central Experimental Farm at Ottawa.
- (2.) Nappan, in Nova Scotia.
- (3.) Brandon, in Manitoba.
- (4.) Indian Head, in the North-west Territories.
- (5.) Agassiz Farm, in British Columbia.

In addition to these main farms, the various provinces maintain their own experimental farms on a smaller scale. The main farms, which are run and controlled by the State, are not worked solely for profit. The experiments are carried on for the purpose of illustrating and demonstrating the best methods of tilling and cultivating the soil, and to ascertain the best kind of artificial manure, and the proper amount to be used. Experiments are also carried out to ascertain the best varieties of cereals, vegetables, fruit-trees, &c. The breeding, feeding, and diseases of cattle are carefully studied on scientific lines. Trial tests are carried on with various kinds of modern farm implements and machinery, in order to prove to farmers what can be done towards cheapening the cost of production, and also saving time and labour. Accurate results of all such experiments are published in attractive but practical bulletins, which are distributed amongst the farmers free of cost. This latter, in my opinion, is a mistake. I believe that if the farmer was called on to pay a small sum for such valuable information he would appreciate it more, and there would be more likelihood of his carefully studying it, and perhaps a greater possibility of his putting the advice into actual practice. I venture to say that this opinion would apply to New Zealand, where many thousands of valuable bulletins are distributed amongst farmers free of charge, and where they are often thrown carelessly to one side, and six months after the farmer writes to one of the Departments asking for the exact information contained in such bulletins which have been lost.

The Central Experimental Farm is situated near Ottawa, being only three miles distant from the main part of the city; this, in addition to having the electric trams running direct to the farm, accounts in a large measure for the thousands of farmers and others who visit this place, which is intended to act as a bureau of information for the two principal provinces—viz., Ontario and Quebec. The farm comprises nearly 500 acres of good land, being a mixture of heavy clay and loam.

The buildings are composed of a large barn, with two wings, having a basement and manure-cellar. There is also a large silo, with a capacity of 350 tons of ensilage, and a dairy where practical dairying is carried on. In addition, there is a granary, seed-testing house, root-house, poultry-houses, piggeries, sheep-houses, &c. There is a fine residence for the Director in Charge, a commodious laboratory, museum, and offices. Other residences for the staff and cottages for the labourers are so built and arranged, as far as comfort and convenience to the work are concerned, as to leave little to be desired.

Amongst the many scientific experiments carried on at the farm perhaps none has attracted more attention than that of the selection of seeds, and that of producing new varieties of cereals by cross-fertilising. This question I have already referred to. At the main farm alone, between 25,000 and 30,000 packages of selected seeds were sent out to farmers in one year; besides this, the same system is followed at the other experi-

mental farms throughout the country. Demonstrations are given to farmers, at the farm, in the cutting of ensilage by machinery, and in the correct methods of storing it in the silos so that it may be cured in a proper and uniform condition without waste.

At the dairy various breeds of milch-cows are kept, and not only the best methods of breeding are studied, but the individual testing of the herd is conducted on similar lines to that (which I have already explained) existing in Denmark. This latter system of weeding out the inferior milkers from herds is now receiving a great deal of attention by dairymen.

There are a hundred-and-one things studied at this farm, but space will not permit of my mentioning them. The Director in Charge is Dr. William Saunders, LL.D.; Mr. J. H. Gridale is the Agriculturist; Mr. James Fletcher, LL.D., is the Entomologist and Botanist; Mr. T. F. Schutt, M.A., is the Resident Chemist; Mr. A. G. Gilbert is in charge of the poultry experiments.

I cannot pass without saying a word about the Ontario Agricultural College at Guelph. This College and farm of nearly 600 acres is operated and controlled by the Provincial Government of Ontario. Although similar experiments to those undertaken at the Dominion Experimental Farm at Ottawa are carried out, the essential aim of the Agricultural College and School is to equip the young sons of farmers with a thorough practical knowledge of every branch of agriculture, including dairying. When each student has completed a course and passed an examination at the College he is granted a diploma of proficiency. This farm is equipped with the most modern buildings, machinery, and implements. Almost every breed of cattle is kept, also divers breeds of sheep, swine, and poultry. The dairy school in connection with this college is one of the most valuable branches of the work carried on. About a hundred students attend this school in a year. Tuition is given free to all Canadian citizens. During the past two or three years a number of students from the Argentine Republic attended the college. There is a fee of about six guineas for students outside Canada. Such a school is, as I have pointed out repeatedly in my reports, invaluable, for the reason that butter and cheese makers must be thoroughly qualified in all branches of butter and cheese making and milk-testing before diplomas are granted. Men holding these diplomas are in a better position to obtain billets as factory-managers, and also the factory-owner is, to a certain extent, protected from employing incompetent butter and cheese makers when he knows that such men hold diplomas. While this is true, I do not wish to convey the idea that all butter and cheese makers who hold diplomas make first-class managers. It depends a good deal on the skill of the man, and the amount of energy put into the business after such training has been gone through. Yet we should avoid engaging the cheap and unqualified man. The President and Director of this College is Mr. G. C. Creelman, one of Canada's ablest agriculturists. They have a highly qualified staff of bacteriologists and chemists, and in Professor Dean, who is in charge of the Dairying Department, they have an able adviser.

23. MANUAL TRAINING IN SCHOOLS.

Technical education has a direct bearing upon the manufacturing industries of any country, and I am firmly convinced that technical training or manual training is equally important in agriculture. What is called the MacDonald Institute is established for that purpose at

Guelph, in Canada, at a cost of nearly £15,000. This institution is designed for instruction in nature-study, household science, and practical manual training. The money for the establishment of this great work has been donated by Sir William MacDonald, of Montreal, Canada. If it were possible to bring about the establishment of a similar training school or schools in this colony, I am sure great good would result from such work to the general community. The Farmers' Union, being such a strong body in this colony, could, I am sure, make their influence felt with the whole farming community, as well as with the Government, in pressing their claims for more technical education and manual training in connection with agriculture. I am of the opinion that some greater attempt should be made to increase the interest of the students in life on the farm in the way of teaching them by technical education or manual training and more of nature-study.

A great deal had already been done in Canada for the development of technical education in the high and public schools, and recently the importance of applying more of such technical education and manual training to agriculture has been recognised. Professor J. W. Robertson has just resigned the Commissionership for Agriculture and Dairying in Canada in order that he may devote the whole of his attention to this great work. He is responsible in a large measure—and to him the honour is due—for initiating this scheme of manual-training schools and technical colleges. A large institution has been erected near Montreal, Quebec, by Sir William MacDonald, where the students are given instruction in research work, experimental and payable farming. Arrangements are made to allow many students from other schools to devote a number of hours each week to study in this institution. There is no charge made at this school. Professor Robertson has always been a strong advocate of closer union between the farm and the college, and his success has been so great that Sir William MacDonald has recognised it to the extent that he is spending thousands for no other purpose than to bring about higher education amongst the young sons of farmers in Canada, or, in other words, to induce more young men to remain on the land instead of drifting into the cities and towns.

Office of the Dairy Commissioner,
Wellington, 9th August, 1905.

THE following reports on South Africa and the Argentine Republic were made by me to Sir J. G. Ward, as Minister of Industries and Commerce, in March, 1904, and published as a parliamentary paper.

They are here reproduced for general information.

J. A. KINSELLA,
Dairy Commissioner.

REPORT ON SOUTH AFRICA.

SIR,— Cape Town, 31st March, 1904.

In accordance with your cabled instructions to proceed to England *via* Argentine, and to report fully on the prospects of New Zealand trade with South Africa, I have now the honour to hand you herewith my report referring to South African trade.

I have, &c.,

The Hon. Sir J. G. Ward, K.C.M.G., J. A. KINSELLA.
Minister of Industries and Commerce, Wellington.

1. PROSPECTS.

In my opinion the prospects for a large and lasting trade between New Zealand and Africa are almost assured, particularly in agricultural and dairy products. In fact, I would almost stake my reputation on the fact that an enormous trade could be done for many years to come if New Zealand people go about supplying this great colony in a proper and businesslike manner. When I say "businesslike manner," I mean that we must endeavour to give the purchaser in Africa exactly what he can sell, and the article must be exactly what will suit the consumer or handler, whether meat, butter, cheese, timber, or any other product, so far as meat and dairy-produce is concerned. If we are not alive to the fact that it is important for us to lay our meat, butter, and cheese down on the African markets in Al condition, we shall shortly find ourselves out of the swim, so far as quality and price are concerned.

I shall deal with each article of importance under separate headings—that is, the products which I think it will pay our colony to give most attention to. Before doing so I should like to give my reasons for prophesying that Africa will for many years be compelled to import large quantities of agricultural products.

In the first place, one has only to look to statistics, and to watch from a practical point of view the large quantities of meat, butter, cheese, and condensed milk which are imported yearly from various countries into Africa. It is only necessary to visit the Imperial Cold-storage and Supply Company's premises at Cape Town and Durban a few times to become acquainted with the enormous cargoes of meat and dairy-produce which pass through these places only, not saying anything of the various other cold-storages which also do a large business.

So long as disease in stock continues in the various colonies of South Africa, particularly in the Transvaal and the Orange River Colony, I am of the opinion that it will be some few years before they will be able to grow enough live-stock to supply local demands.

For the above reasons I am satisfied that New Zealand should be able to get a good look-in with her beef, mutton, tongues, kidneys, rabbits, butter, cheese, &c.

2. BEEF.

The latest small shipments of New Zealand beef seem to be giving almost entire satisfaction in Africa. I have made inquiries in Cape Town, Durban, and up-country at Johannesburg, Pretoria, Krugersdorp, &c., and, although Argentine beef is largely used, they seem to prefer our nice small plump quarters to the enormous fat quarters from the Argentine; and if we could supply customers promptly and in quantities to suit demands, there is no reason to doubt but that we, as a British producing colony, should get a large share of the trade against the Argentine, at a shade better prices than we can secure in the Old Country.

In catering for the African trade, so far as meat is concerned, we should aim to send only the finest quality, for the reason that it is a new market and other countries are endeavouring to lay down in Africa just exactly the kind of meat and produce the people ask for. The above being so, I say it behoves the producers and shippers in New Zealand to take example from other countries.

We must send the proper weight of beef, and, above all, careful attention should be given to the dressing of it, both in the killing process and also in the covering which protects the meat from the rough handling it receives in Africa, particularly when it is remembered that a large quantity of the beef and mutton has to travel hundreds of miles up country to Johannesburg, Pretoria, Krugersdorp, Potchestrome, Standerton, &c., in the Transvaal, as well as the quantities that go to other States in Africa. This meat is conveyed in cars that cannot be termed the best in the world, and the handling is done by what can be rightly termed the very dirtiest class of labour. I have seen labour of all kinds in many parts of the world, and I am of the opinion that the dirty, oily, half-naked, strong-smelling Kaffir is the most undesirable man on earth to be allowed to handle the fresh or frozen food eaten by white men.

3. MUTTON.

I have seen a good deal of New Zealand mutton sold in competition with Argentine in different parts of Africa, and the earlier shipments were found to be rather heavy and too fat. However, the latter shipments arriving seem to suit the public better.

From my own practical experience of eating Argentine and New Zealand mutton and lamb, I have become convinced that we must send nice, medium-sized, plump sheep, not too fat, and, above all, have them well dressed and properly covered in cotton scrim and canvas, and every attention should be paid to landing the shipments according to contract—at least, as near as possible.

4. BEEF-TONGUES.

New Zealand tongues which I have examined in Africa are not what they should be; the tongues when opened up are found to be out of shape, long, flabby, and discoloured. The bulk of the samples which I saw were

also packed in rough, untidy cases, much too long for the tongues. On the other hand, the Argentine tongues are packed in neat, nicely dressed, and branded cases. The tongues also have the appearance of being chilled while in the natural form, after which they are packed in cases to fit the tongues. The chilling of the tongues and packing in neat cases does not permit of their becoming discoloured, or admit of their becoming long, habby, and out of shape before they are frozen. The tongues which I saw packed in this way opened up in fine condition, being of the natural colour and shape, and were giving entire satisfaction to customers.

These are points which shippers in New Zealand should pay attention to. When I have an opportunity of examining closely the methods of packing in the Argentine Republic, I may be in a position to offer a few suggestions which will, I hope, be of some value to producers and shippers in New Zealand.

5. KIDNEYS.

In dealing with this part of our trade, no matter how small it may be, I wish to emphasize the fact that I was disgusted with the few small shipments of New Zealand kidneys which I examined in Africa. Some of the shippers in New Zealand may come to the conclusion that my report is one on the lines of finding fault, but I beg to point out that my inquiries and investigations were of a practical nature, and that I am speaking of something which I have seen with my own eyes, and not of what some dealer was able to convince me were the facts.

In the first place, I found New Zealand kidneys were sent to Africa in rough, dirty cases, and, still worse, some in canvas sacks, being thrown in regardless of size or quality. How, then, I ask, are we to compete with the Argentine with this class of goods, packed in the manner above described, and in the face of the fact that handlers have shown me Argentine kidneys packed in neatly planed cases, with five dozen in each case, all of which are selected and sized before packing, and nearly all the cases are lined with a cheap parchment-paper?

There should be a fairly decent trade in this line if the goods are sent in a proper condition.

6. TINNED MEATS.

In tinned meats I am afraid we do not stand much chance of developing a large trade, or even of getting a good cut-in, against the Americans. They have already practically got control of the bulk of the tinned-meat business in Africa. While the above is true, I may state that I have examined many tins of American tongues, and also a few samples of tongues from Great Britain, and after seeing these tongues and eating some of them, I say most emphatically that the New Zealand sheep's tongues are the finest I have seen or eaten not only in Africa, but in any other part of the world; and I am sure, if we could advertise as the Americans do, and if we were in a position to deliver our tinned sheep's tongues in quantities and at exactly the time the purchasers want them, we should be able to capture a large share of the African trade in this line. In tinned beef, the Armour people and the Australians have such a strong hold that I cannot suggest any way for our even getting a cut-in on anything like a profitable basis to the producers of New Zealand.

7. HAMS AND BACON.

The great trouble with this part of our trade with Africa seems to be in the fact that purchasers cannot get the goods in New Zealand. One

dealer in Cape Town informed me that he was prepared to place orders for almost any quantity of New Zealand hams and light bacon at 1d. per pound more than they were paying for Canadian, American, and English goods. Every man whom I met who had handled New Zealand hams and bacon spoke in the highest terms of its fine quality. Nearly all merchants prefer light and medium-sized hams. I hope our New Zealand farmers will soon wake up to the importance of growing more pork. In such a great butter-making country as New Zealand, where skim-milk is in abundance almost all over the colony, every dairy-farmer should be raising and fattening pigs on the lines on which it is done amongst dairymen in Denmark.

We have also many other facilities for growing pork in New Zealand apart from the dairy industry. The fact that clover, rape, tares, vetches, and other suitable green crops for raising pigs on can be grown with certainty and with very little labour should make the production of pork a profitable business in the colony.

In Canada a large amount of revenue is derived from the pork industry, and farmers are becoming more alive each year to the fact that there is money in the business.

8. POULTRY.

The same may be said of our poultry trade with Africa as may be said of our hams and bacon—namely, that the purchasers cannot get enough of it. A number of dealers informed me that they were delighted with the excellent quality of New Zealand poultry, and were anxious to secure regular shipments, but that the agents were not able to fill the orders.

When in Cape Town I had the pleasure of examining some consignments of Russian poultry, and also a few lots from Canada and England. The Russian birds were much inferior to the Canadian and English. The Russian birds were dark in the flesh, and nearly all had black legs, which latter is an objection. On the other hand, the Canadian and English poultry were plump, and the meat was of a lighter colour, and nearly all the birds had smooth, bright-coloured legs.

9. FISH.

It may be asked by New-Zealanders what Kinsella knows about fish. In the first place I must point out that I was born on the banks of a great fishing-stream in Canada called Grey's Creek, where we, when only infants, caught many different varieties of fish. I have also had some experience in catching those splendid rock-fish—pickerel, perch, pike, &c., which are so well known to the British people, and which are caught in such large numbers in the beautiful cold fresh waters of the St. Lawrence River.

My experience in New Zealand and Africa has, however, been more from a consuming standpoint, and I think there cannot be any more convincing argument than that of practical experience—that is, by eating the fish both fresh and after being frozen. New Zealand flounders, blue-cod, pickerel, and whitebait are perhaps amongst the finest varieties of fish I have ever eaten. Flounders and whitebait in New Zealand, when freshly caught and properly cooked, are, I think, the finest fish in the world.

While the above is true, I am afraid New Zealand will not be able to

do much with Africa in the fish trade, unless it is with blue-cod and tinned whitebait. During my eight months' residence and travelling in Africa I was informed by many dealers, including the Cape Fishery Company, who have branches in Johannesburg and Pretoria, that the majority of New Zealand fish were unsuitable for the African markets. The reason given was that they were too dry after being cooked, and also seemed to be void of flavour.

While in Durban at the beginning of January I discussed this question with Mr. Gow, our Trade Representative. We examined New Zealand fish in the cold-storages, and in order to prove the correctness of the statements above referred to, Mr. Gow and myself secured a few nice frozen flounders and a blue-cod, and had them defrosted and properly cooked in New Zealand style by an Australian lady. My reason for being anxious to do this was that I am always after practical tests. After having the fish cooked and a trial of eating them, both Mr. Gow and myself were in a position to speak authentically on the question. We found that the flounders through the freezing and defrosting process had lost nearly all that natural flavour so characteristic of them when eaten in New Zealand; besides, we found them dry and chippy. The blue-cod, on the other hand, seemed to have retained its flavour much better, and, in my opinion, the latter fish would find a market in Africa. With reference to whitebait, I would advise trial shipments being made in tins.

10. RABBITS.

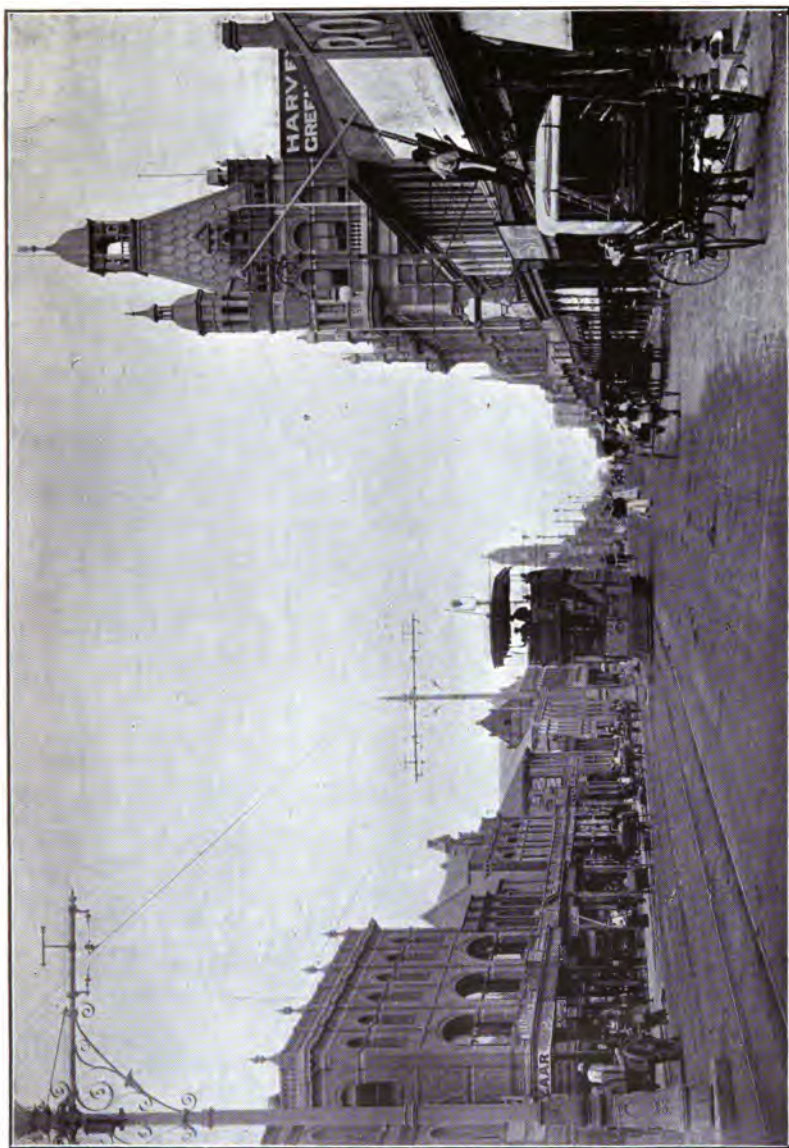
I had the pleasure of examining some New Zealand rabbits in the freezing-works at Durban and Cape Town. I also saw a few samples up-country at Johannesburg and Pretoria, and have eaten New Zealand rabbits after being frozen and defrosted, and I am glad to be able to say that they were very fine in quality, and most people whom I came in contact with who had had any experience with New Zealand rabbits spoke well of their superior quality.

I would like to point out to New Zealand shippers that it is equally important for them to send their goods to Africa in neat cases as it is in sending them to Great Britain. I would recommend that all rabbits be carefully selected, sized, and graded, after which they should be carefully packed in neat cases. Each case should be neatly branded; the works "New Zealand" should be on the case in large letters.

11. BUTTER.

I do not wish to find fault all round about our methods of shipping and the quality of our produce, but I do feel as though I am placing some hard cold facts before the butter producers and dealers of New Zealand which should at least receive their careful consideration. Before leaving New Zealand last year I was strongly opposed to holding large quantities of butter in the cold-storages through the winter with a view to catching a higher market in the spring. My reason for this was that, in all my experience in other countries where perishable produce is held for any great length of time, I have found that, although a larger price may be obtained, the question of deterioration, as a rule, cuts badly against the reputation of such produce, no matter what market it is sold on.

At the end of April last, just before leaving New Zealand, I made inquiries at the various freezing-works, and found that about a hundred and twenty thousand boxes of butter were stored in the colony. I at



MAIN STREET (WEST STREET) IN DURBAN, NATAL, S. AFRICA.

that time made recommendations personally and through the Press of the colony to a number of the owners to ship the butter while new to the British markets. This could have been done at a profitable price to the producers. Instead of that being done, the butter was held through the winter and a good deal of it shipped to Africa.

While on duty for the Transvaal Government, and when travelling about the country, I regretted to find some of our best brands on the market in an old-state condition, and, although at that time I had no intention whatever of returning to New Zealand, I wrote the Right Hon. Mr. Seddon an unsolicited letter with reference to our meat and butter trade. Later on, when my re-engagement with the New Zealand Government took place, I, in company with Mr. Gow, made some investigations at Dunban; I also examined a number of our brands of butter at Cape Town and Port Elizabeth in the month of January.

The quality of the majority of butters which I examined had deteriorated very much, and this could not be wondered at when I say that I saw some of the same butter before leaving New Zealand eight or nine months before I examined it in Africa. One brand which has a good reputation in New Zealand I found, according to the date-marks, to be twelve months old; of course, the handlers in Africa rarely look for date-marks, although they do pay attention to our grade-marks, and are most particular to see that the goods bear the Government's first-grade stamp. The fact that the dealers and consumers in Africa do not know the age of our butter naturally causes them to compare our old butter on the same counters with Argentine fresh. The latter butter would not be in the same street with ours so far as quality is concerned if our goods were laid down on the markets in a fairly fresh condition, or rather at short notice. As early as November I had the pleasure of examining some of New Zealand's stored butter in Cape Town in company with Mr. Gow, our Trade Commissioner. I at that time made the statement to him that it was to be regretted that New Zealand producers saw fit to hold such well-made butter until it considerably aged, and then to place it on a practically new market which should have a large outlet for our produce in future, and to which market we should send only the choicest quality.

Before leaving Durban in January, Mr. Gow informed me that he had heard very bad reports about a well-known New Zealand brand of butter which was handled by Reiners, Von Laers, and Co. On my way from Durban to Cape Town I was able to get ashore at Port Elizabeth for a few hours, where I examined the butter in question. Unfortunately for the reputation of New Zealand butter, the agents had quite a stock of this butter on hand at the time of my visit, and they informed me that almost every package they had sent out lately to up-country towns was being returned on the score of inferior quality. I, however, did not wonder much at this statement after examining the boxes, for I found according to the date-marks that the butter was then about ten months old. I carefully examined a number of packages of the butter, and found it had deteriorated very much in quality, although the butter was well made in the manufacturing process. The butter possessed a stale, or rather tallowy, flavour. In fact, some of it could be termed rancid, and hardly fit for cooking purposes. I at that time advised the Department of Industries and Commerce of this brand of butter, and asked that the Dairying Division be instructed to bring the matter under the notice of the company or manufacturers.

If New Zealand producers do not get alive to the fact that it is just

as important for them to send the very finest quality of butter, and that while new or in a fairly fresh condition, to the African markets as it is to send it in the latter condition to Great Britain, they will, in my opinion, have no hope of competing successfully against the Argentine. I was informed by dealers in Cape Town and Durban that they had to pay more money for New Zealand butter than they were purchasing Argentine for, and that the quality of the practically fresh Argentine butter, which was being laid down in Africa in eighteen to twenty days, was preferred to our stored goods. A quantity of the latter was still held in the freezing-works, and was being placed on the markets in competition with the Argentine.

The only chance we have in competing with the Argentine is on the score of better quality, and I am confident that if our producers aim to get their butter on the African markets soon after it is made, the Argentine people cannot touch us so far as quality is concerned. I have examined a great deal of Argentine butter, and eaten it on the tables in various towns and cities in the Transvaal, Cape Colony, and Natal, and there are two things only in its favour: it is paler in colour than ours, which is preferred; it is also laid down fresher. On the other hand, the Argentine butter has the appearance of being poorly made; it has a very greasy appearance, almost resembling lard; it has no character, is almost void of texture, and I am confident if it was put to the test which some of our butter has had to undergo as described above—that is, if it was held for a whole year and exposed to all temperatures—it would, in my opinion, as an old experienced butter-maker, not be fit for anything else than axle-grease at the end of that time.

Although New Zealand butter has had hard luck on the African markets for the reasons above explained, it is a pleasure to a practical man to note how well it is made, the body, and texture. The general get-up, including boxes, branding, and finish, I do not think can be beaten in any part of the world.

I am pleased to be able to state that some of the later shipments of New Zealand's new season's make of butter which I examined in Africa opened up in excellent condition, and, as I have just explained, if our people would endeavour to send such butters to Africa, I reckon we are sure to get a good look-in against all competitors.

Amongst the brands which I examined, and which could be called choice (and I say this without in any way advertising them, but merely giving them credit for assisting in building up a reputation for New Zealand butter as a whole), was "Bell Block" (Anchor Dairy Association), "Eltham," "Taieri and Peninsula" (Dunedin), "Defiance," and "Pakeha."

Owing to the continued prevalence of disease in stock, and the slow manner in which the land is being settled with good British settlers in many parts of Africa, I have become convinced that there will be a large outlet for our dairy-produce for years to come. It will take a few years for Africa to produce enough milk to fill the requirements of the cities and towns alone, or, in other words, to produce fresh milk enough to take the place of the enormous quantities of imported condensed milk consumed at the present time.

One point which I have omitted is the question of wiring all butter-boxes for the African markets. This is very important. The timber used for some of the boxes is also too light to stand the rough handling.

12. CHEESE.

So far as cheese is concerned, we do very little business with Africa at the present time, and unless we adopt some better system of laying our cheese down in a sounder condition there is very little hope of our establishing anything like a decent connection on her markets. My investigations proved that the few shipments of cheese sent by us to Africa are landed on the wharves in Cape Town and Durban in what might be termed a disgraceful condition. A large percentage of the cases were found to be in a filthy condition, and many of them broken. What is worse still is the fact that the cheese itself is seriously injured in quality during transit by being carried in the warm holds of the ships in what certainly is a hot voyage. The cheese is roughly carried as ordinary cargo, and the facilities for handling, &c., are very much inferior to the methods adopted for our British shipments. The above being true, it is only reasonable to expect that the cheese will suffer serious deterioration.

This rough treatment and severe heating of the cheese starts the butter-fat, and causes the curd to become dry and chippy, or in other words, crumbly. It seems also to develop a strong acid taste, and the cheese goes off flavour very quickly. Our cheese that goes to Great Britain which is carried in cool-chambers opens up in fine condition, and instead of being dry and flinty it breaks down neatly and shows a proper texture; besides, in the majority of cases it retains its flavour for a much longer period than when it is exposed to a high temperature. It is also free from cracks, and does not show butter-oil on the surface, as do our African shipments.

RECOMMENDATIONS.

Where there is a demand for large cheese, or, rather, when cheeses are sent to Africa weighing 65 lb. to 70 lb., the cases should be made of fairly heavy dressed timber, and they should be wired or strongly bound with $\frac{3}{8}$ in. galvanised hoop-iron, so as to stand the rough treatment which they are subject to on the steamers and wharves. I would also advise having the battens slightly closer together than for the British shipments, so as to prevent rats from getting access to the cheese through the cracks. This latter is not so necessary when cheese is carried in cool-chambers and when it is stored in the freezing-chambers on arrival at Durban and Cape Town.

The medium cheese weighing about 30 lb. to 35 lb. is in better demand in Africa than the large sizes. The bulk of small shipments which I examined there were packed in a fairly satisfactory manner, although some of the timber, as in the case of the large cheese, was too light, and the cases were not wired or hooped.

From all my experience in Africa I found that the most preferable size of a Cheddar cheese we can send to that market is the loaf, weighing about 8 lb. Loaf-cheese should be packed in closely made cases, and the timber should be dressed. The cases should also be plainly and neatly branded. There should be thin boards about $\frac{1}{4}$ in. thick in the form of small partitions between each cheese.

In hot climates it is important that the cheeses should not be allowed to touch each other; this causes friction of the two surfaces, and tends to start the butter-fat, and makes the cheese flatten on the sides, which pressure afterwards starts decay. Besides, if the small cheeses are divided in the cases they will also be found to open up freer from mould. A better manner still of packing loaf-cheese for the hot climates of South

Africa is to put them up in small cases of six cheeses each, packed in dry sawdust and coarse salt.

Even yet a great quantity of goods is packed on mules in the up-country districts, and that very often in the roasting sun. The latter being so, it is not wise to put more than six cheeses in a case, which makes the handling and packing on the mules much more convenient.

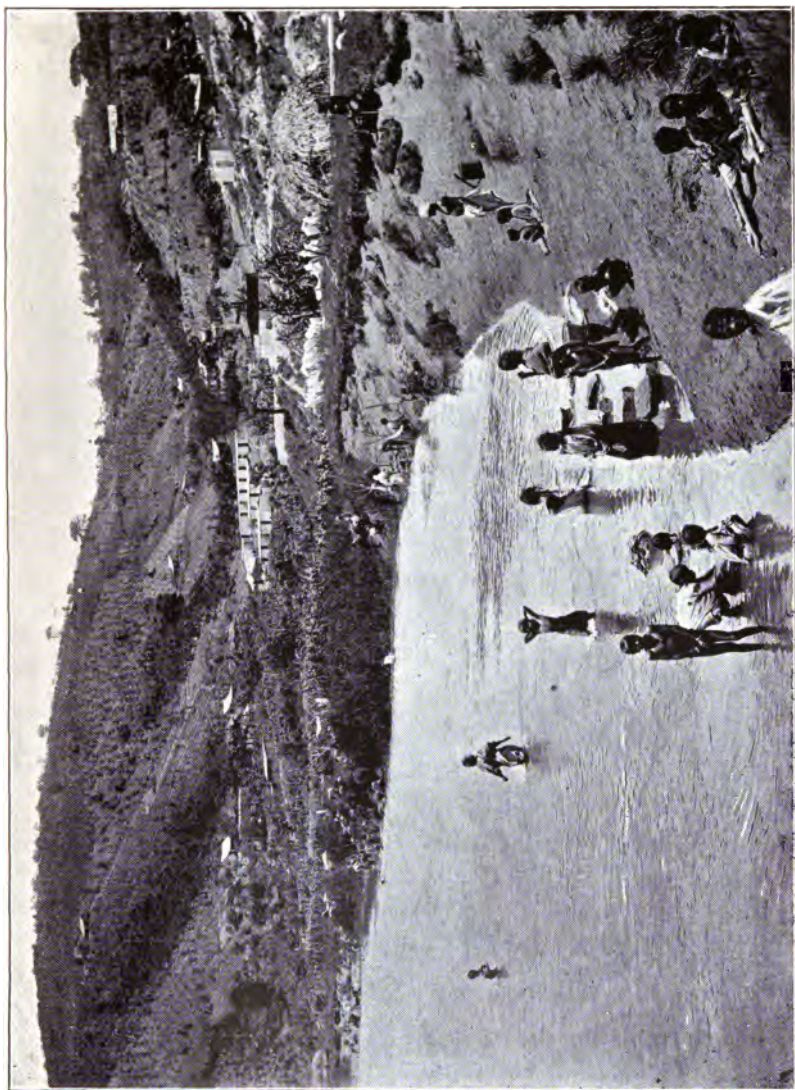
During the time the war was on it will be remembered that a few trial-shipments of loaf-cheese were sent to Africa by the Agricultural Department at the request of the Agency-General. These were packed in small cases in sawdust and salt, and it was reported that the cheese opened up in splendid condition, and gave entire satisfaction in Africa. The cases in which these cheeses were shipped cost a little more money than the ordinary loaf-cheese case, for the reason that I had them specially made with two of the sides ventilated by boring a number of small holes in the boards, and inside on the ventilated ends I had placed a rough canvas scrim which kept the sawdust from running out. The two ventilated ends being opposite each other permits of a sort of current of air passing through. If it is cold air, it helps to preserve the cheese; if hot air, it may affect the cheese a little, but it has also a good effect in the carriage of the cheese, particularly where they are packed by mules in hot climates, for the reason that the warm air dries the sawdust and prevents dampness and mould. Although the extra expense of the cases and the dry sawdust and salt is much greater than that of packing the cheese in the ordinary way, I am of the opinion that dealers in Africa will pay a much higher price for goods put up in this way, for the reason that they are anxious to give their customers a good article, or, in other words, something they can sell and something the consumer will eat. If we aim to do this, we are not only opening up a trade for our produce, but we are building up a reputation on the score of good quality.

If we continue to ship cheese to Africa, I would advise a slight change in the manufacturing process. I am convinced that we should make a slightly firmer cheese, in order that it may stand the carriage over and the hot climate of Africa. We need not necessarily hand-stir too much of the moisture out of the curd, but a shade more hand-stirring and a little higher cooking or heating, and the addition of, say, $\frac{1}{2}$ lb. to $\frac{3}{4}$ lb. more salt to each 100 lb. of curd will be an advantage.

The most important recommendation I have to make is that of some arrangement being made with the shipping companies to have cool-chambers fitted on the direct steamers which carry our produce, whereby the cheese can be kept during the voyage at a temperature of between 45° and 50° Fahr.

I maintain that if we are seeking for trade on a new market we should aim to land our cheese in the very best possible condition, no matter how small the quantity be at the beginning of such trade.

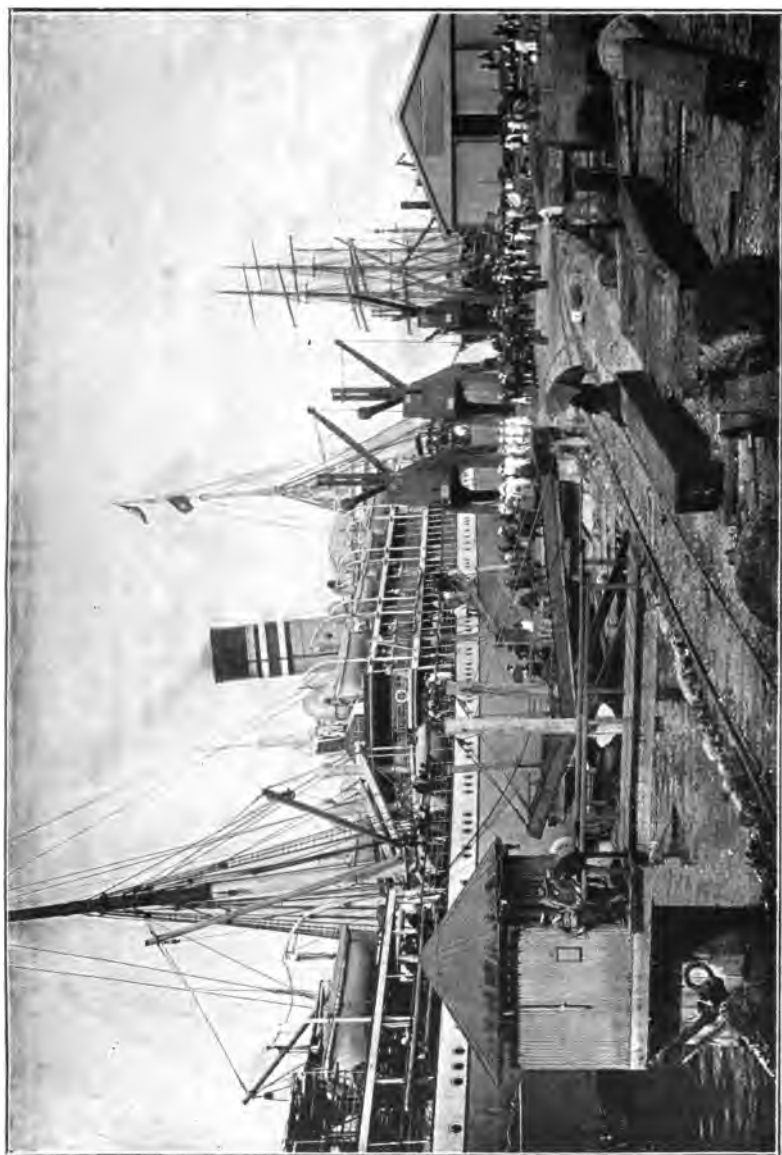
J. A. KINSELLA.



PINEAPPLE AND VEGETABLE GARDENS AT UMGENT, DURBAN, NATAL, S. AFRICA. COOLIES
BATHING IN THE RIVER.



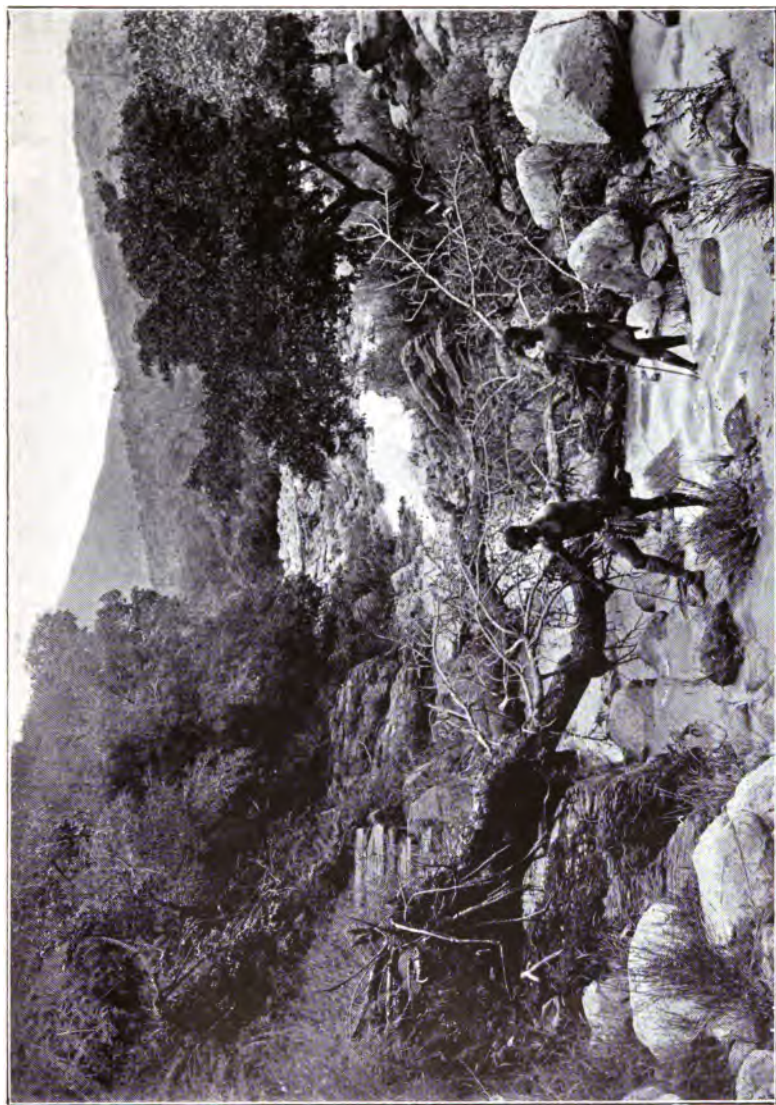
THE NEW FLOATING DOCK, DURBAN, NATAL.



THE POINT, DURBAN, NATAL, S. AFRICA.



NATIVE (ZULU) LABOURERS IN THEIR KRAAL, NATAL, S. AFRICA.



A PRETTY SCENE ON THE UMLAAS RIVER, NATAL. KAFFIRS IN THEIR EVERY-DAY COSTUME.

REPORT ON VISIT TO THE ARGENTINE REPUBLIC.

SIR,—

Agent-General's Office, London, 4th June, 1904.

I have the honour to submit herewith a brief report of my recent investigations in connection with agriculture, dairying, and other commercial enterprises in the Argentine Republic.

I have, &c.,

J. A. KINSELLA,

Dairy Commissioner.

The Hon. Sir J. G. Ward, K.C.M.G.,
Minister of Industries and Commerce,
Wellington, New Zealand.

1. INTRODUCTION.

IN making a general report on the agricultural and pastoral industries of that great, or, I may say, vast prairie country, the Argentine Republic, I feel as though I had had only a mere glimpse over her extensive lands, owned and controlled by a great Spanish race. First of all, I may point out that in order to permit of a thorough, or, rather, a general and practical knowledge of this vast country being obtained, it would be necessary for one to remain in the country for at least a year and a half or two years; even then it would require almost constant travelling and very careful observations and inquiries in order to become acquainted with the details connected with farming, climates, &c. I therefore submit that it would not be reasonable to expect that I should write all of this brief report from actual observations during my stay in the republic. I have, however, travelled a great deal while there, and, in my opinion, no better means could be adopted of obtaining sound information than of practical observations throughout such a vast agricultural country.

When one gets into the dairying and wheat districts, and has personal chats and discussions with the people who are actually engaged on the land, he is, in my opinion, in a position to get more reliable information than could be obtained from any other source. Although I found it difficult while in the country districts to carry on a conversation with the native Spanish people, owing to my not being acquainted with their language, yet I was able to obtain a good deal of practical information with regard to farming, &c., in the country.

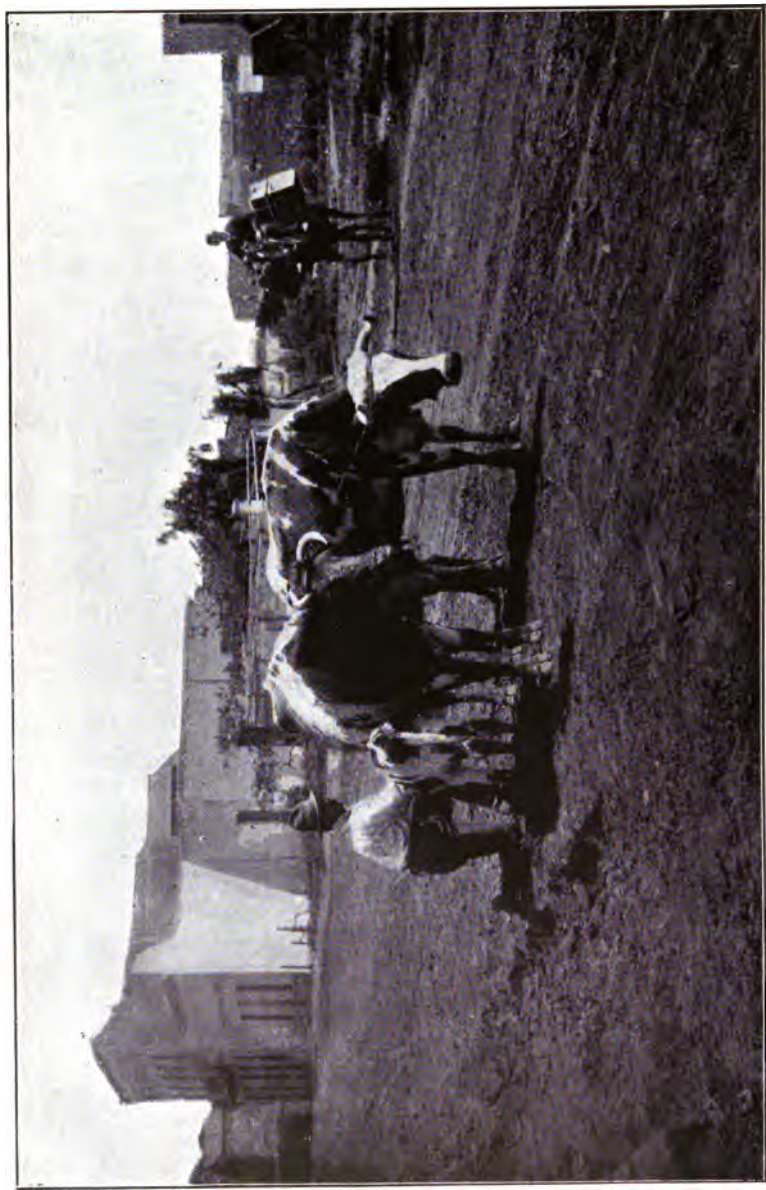
Travelling by rail is rather expensive in the Argentine, and while I was fortunate in obtaining a few free passes over the railways, my expenses, on the other hand, ran into a fairly large sum. I endeavoured however as far as possible to keep down expenses—at least, unnecessary expenses.

Without going into history it may be well for me to point out that the Argentine Republic is a cosmopolitan country, which has been populated largely from Europe. The country had in the earlier days the task of supplanting savagery by civilisation; in the end, however, the savage races had to give way to the Caucasian races, or otherwise be annihilated by them. The spirit which animated the Latin races after the discovery

of North America by Columbus led to the formation of many exploring parties in Spain. Amongst the first to explore the country now the Argentine Republic was Don Juan Diaz de Solis. He first struck a large river, which he named the "Sweet Sea," or "Navara Dulac," which is now known as the great river La Plata or River Plate. After landing he was killed by the Red Indians. This took place as far back as 1515. Many other explorers met with a similar fate, until the great General San Martin finally suppressed the Indians, and it was only then that things settled down on a sound basis in the Argentine Republic. In what is known as the Avenue de Mayo, in front of the National Government Buildings in the City of Buenos Aires, stands a fine statue of that great general, whose name will always be remembered by all Argentinos.

The President of the Republic in office at the time of my visit was General Roca. When I was in the Argentine they were on the eve of a new election, which would be for the purpose of determining who would be their next President. I was told that the old President under their laws cannot be re-elected by the people; it therefore follows that an entirely new President must be appointed by the voice of the people. It was in 1880 that General Roca was first elected President. After six years of office he was followed by Don Miguel Juarez Celman, who resigned in 1890. After a great revolution Dr. Carlos Pilegrini became President in 1892. Dr. Lewis Saenz Pena was elected President, after which, in 1896, Dr. Jose Euriburn was appointed. In October of that year General Roca again became President. During my short stay in the Argentine I heard so many nice things from all quarters with reference to General Roca's admirable qualities and his great administrative powers that I have much pleasure in introducing his name to the public of New Zealand. The fact cannot be got away from that under General Roca's wise administration the Argentine Republic had gone ahead in leaps and bounds, and has, generally speaking, prospered. And by his determined purpose to maintain peace, the impending war with Chili has been averted, and it may be fairly said that permanent peace has been established in the country.

The Argentine is a protectionist country; its resources for conducting the Government are largely raised from the Customs duties. In 1899 the imports into the country subject to duty were \$102,080,738 gold. This statement may be wondered at, but when I say that the Argentine has over 120,000,000 sheep and the United States has only about 62,000,000, you can arrive at your own conclusion on this point. Exports from Argentina for 1902 and the first quarter of 1903 were \$220,000,000 gold, and imports \$100,000,000 gold, making a grand total for foreign trade of \$320,000,000 gold, equivalent to £64,000,000. Nearly all products produced and manufactured in the Argentine are not heavily taxed when exported to Britain or her colonies, whereas, on the other hand, nearly everything she imports from foreign countries is heavily taxed. This is on similar lines to the system in vogue—the retaliation system—which has long since been adopted in the United States of America; whereas in the case of goods shipped from the Argentine to Great Britain the open-door policy still exists. Without for a moment thinking of touching on political matters, I think I could safely suggest that the sooner Mr. Chamberlain's scheme of preferential tariffs is adopted for both Great Britain and her colonies the better. I am glad indeed to note that our Prime Minister, the Right Hon. Richard Seddon, has been one of the first to move in the direction of taxing foreign goods



SYSTEM OF MILKING IN THE STREETS FOR DELIVERY, BUENOS AIRES, ARGENTINE.

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GAUCHOS (NATIVES) BRINGING MILK INTO THE CITY OF BUENOS AIRES.

shipped into New Zealand, and of gaining a preference for some of that colony's products which are shipped to British markets.

2. DAIRYING IN THE ARGENTINE.

In dealing with dairying in the Argentine Republic, I propose to speak more on the practical side of the question, for the reason that most New-Zealanders interested in this industry have already become acquainted with the theoretical part of what the Argentine is doing in this branch of agriculture, through the Australasian agricultural papers.

In the Argentine Republic only a very few years ago the dairy industry had practically no existence. The milk of the millions of cows which were in the country was utilised for no other purpose than for raising the calves. It must, however, be remembered that the Argentinos have always been producers of meat and hides, and even in the early days of the country they bred many good beef cattle.

At the present day we find the milk-supply business of many of the small towns, and even the suburbs of the large cities, such as Buenos Aires, carried on in a very primitive fashion. The milk for city and town supply is in some cases brought in in cans on horseback, the cans being slung at each side of the horse, and the motion of the horse causes the milk to be churned, thereby producing a soft butter. This butter is collected or gathered and sold to the clients; and the milk, which can hardly be termed buttermilk, is also sold at a fair price, owing to the large percentage of fat still left in it. Many of the (native) Spanish people, strange to say, yet prefer this mushy soft butter to a good article produced in a butter-factory.

Another system of reaching the city milk-purchaser with what they term a pure milk is by driving the cows around the streets and milking them into small graduating measures or tin mugs in front of the houses. The cow is very often stopped a dozen times, or at least the process is carried out in front of a dozen purchasers' premises. The calf must always be tied to the leg of the cow, otherwise the cow will not give down her milk—so the owner of the cow claims.

All this, however, is being gradually done away with, particularly in the large City of Buenos Aires. In the latter city you will now find many fine places for drinking milk, milk shakes, &c. These places, as a rule, are painted white inside and are kept scrupulously clean. The milk handled by the milk-shops is sent in from the large estancias (farms) in the country. They have also a few factories where milk is pasteurised and sterilised for city supply; and there is at the present time a large company being formed, and an enormous building is being erected for the purpose of pasteurising and sterilising milk, which will serve nearly the whole of the City of Buenos Aires. I was also informed that it is proposed to manufacture maternised milk.

Before dealing with the actual butter-making part of the business, I shall describe roughly the methods of milking which prevail in most milking districts of the Argentine. The herds, large or small, are driven into what may be called milking-yards, which are fenced with wire, generally a special woven wire manufactured in the republic. Nearly all of the dairy cows in that great republic are milked with the calf by the mother's side; as a rule, it is tied to the leg of the cow. Although the milking-yards are not very large, you will very often find large herds of cows milked in them. The animals are milked for a great length of time in the same yards, until 8 in. or 10 in. of manure collects. They are

then changed to another place, and this manure is allowed to dry, after which it is cut into squares and stacked like wood, and utilised for fuel. This system is carried on in districts where wood is scarce and coal dear. As can be imagined, after a heavy rainstorm, it is not a very pleasant business to milk cows in a milking-yard such as described above. Of course, at a few of the "estancias" they have fairly decent places for milking.

There are two systems of milking—at least, two of them I have seen personally—and these systems seem to prevail nearly all over the milking districts of the Argentine. The idea seems to prevail amongst the native people that if the calf is taken away from the mother she will not give down her milk, and will, therefore, be rendered useless as a milker. I was astonished to find the people of the Argentine carrying on the milking business in this crude manner. When in Africa, I was not surprised to see the Kaffirs in Natal milking their cows in nearly the same manner as the majority of the cows in the Argentine are milked. The Kaffirs in Natal firmly believe that no cow will give milk unless the calf is with her at the time the milking takes place. The slight difference between the Kaffir system and that which is in vogue in the Argentine is that the Kaffir allows the calf to suck whenever he can get a chance during the process of milking. As stated above, there are two systems of milking in the Argentine. One is to allow the calf to suck a portion of the milk from the mother before the operator begins the milking process. After the calf has taken his share of the milk, he is tied to the mother out of reach of the udder. The other system, and one which is generally adopted, is to milk about two-thirds of the milk from the cow, and then to unfasten the calf and allow it to suck the balance. This latter portion of the milk, which, as a rule, would be about one-third of the milking, and which also contains the largest amount of butter-fat, the calf gets. I am quite sure that if this portion of the milk of the bulk of the Argentine cows was tested it would be found to contain $5\frac{1}{2}$ to 7 per cent. of butter-fat. Butter-fat at 10d. per pound is pretty expensive feed for raising calves, particularly where a farmer is aiming to dairy for a profit.

The milking is done largely throughout the dairying districts by Bastous; very few of the native "Spanish" people care to indulge in this kind of labour. The Bastous, I am informed, emanated from the southern part of France. They are said to be a very industrious people, and make first-class milking-hands. They seem a contented people, and, although they do not have the same facilities for entertaining as the people in the cities do, they always seem to have their own fun on particular holidays. The homes of the Bastous on the farms or estancias are not very elaborate; any sort of a rough hut of slabs or sods, covered with a tin or thatched roof, answers the purpose. In such a comparatively mild climate as the Argentine they do not need nearly as much protection as we do in the cattle districts of our country, particularly in the South Island of New Zealand. It can therefore easily be imagined what an advantage a country like the Argentine, as a dairying country, has even over Canada, United States, and Russia: abundance of grass and water and sunshine almost the year round.

In the Argentine, silos for the curing of green fodder are a thing almost unknown; there are a few, but they can hardly be called "silos." Where the cattle are fed on any fodder, it is principally alfalfa or full-grown maize. The maize is rarely ever cut green and fed to the cattle, as is done in other countries. In some cases the maize is fed to the cows



A HERD OF ARGENTINE CATTLE ON THE PRAIRIE.

in the ear. In most dairying districts of the Argentine it is, however, not necessary to provide much, if any, winter food for the cattle, grass being in abundance the winter through. I think the Argentine is the finest grass country in the world. This, together with the beautiful water, which can be obtained nearly all over the country at a reasonable depth, makes stock-growing cheap and easy. In many districts farmers do not require to sink more than 15 ft. to 20 ft. in order to strike a good supply of water.

Of course, in some places it is necessary to sink artesian wells. Where this is done the water-supply is never-failing. It is also claimed by experts that the water-supply, generally speaking, throughout the Argentine is a very pure one. This may be accounted for in some of the districts which I visited by the fact that the water in many wells filters through sand-beds—that is, after you go down a certain depth. Take it all round, I think the Argentine has the clearest and probably the best water for butter-making purposes that it is possible to find in any country.

The following is a list of the names of the butter-factories in the Argentine, and their respective daily outputs, at the time of my visit at the end of March, 1904:—

Name of Factory and Situation.	Daily Output in Pounds
La Union Argentina, Buenos Aires City	30,837
La Tanilera, Tandil, on the Great Southern Railway	5,506
Progreso, Buenos Aires City	5,506
Co-operacion de Cremerias, Buenos Aires City	8,149
La Martona, Vicensete Casares, on the Great Southern Railway	4,405
La Union Gaudarende, Gaudara, on the Great Southern Railway	4,184
La Delicia, Florencio Varela, on the Great Southern Railway	1,762
La Vritel, Chascomus, on the Great Southern Railway	1,541
La Celia, Navarro, on the Great Southern Railway	1,321
Molino del Oeste, Buenos Aires	4,405
Lagranga Blanca, Marina, and other small factories in Buenos Aires Province and the other provinces	7,709

I give the above information so that our dairymen may know the size or outputs of the Argentine factories. For these statistics I am indebted to Señor J. B. Rospide, representative of the newspaper *Haritza*.

As I mentioned at the outset, dairying in the Argentine is practically a new industry. The first separators were introduced in the years 1890 and 1891. The butter exported from the Argentine in 1891 was 1,320 kilos. Previous to 1901, salted butter in tins was an article of import into the Argentine. In 1895, 400 tons was exported; in 1901, 1,500 tons; and in 1902, over 4,000 tons. According to the latest statistics issued by the Ministry for Agriculture the export of butter for 1903 was 5,696 tons, an increase over last year of 1,696 tons. The Argentine Year-book draws attention to the fact that if this rate of increase is maintained an annual export of 50,000 tons may be looked for shortly. It further states that to obtain this it would only be necessary to milk half the available number of cows in the Argentine, which are estimated at nearly twelve millions.

"So important is this industry becoming," says the Argentine Year-book, "it would be a mistake to consider it other than subsidiary and complementary to what must always remain the principal business of the country, the breeding of cattle and sheep for exportation, either as live-stock or through the freezing establishment; its development, in fact, should be regulated in such a manner that the abstraction of butter from the milk may not be permitted to interfere with the life and growth of the young animals on whose weight and quality so much depends." If it were not true that calves of good quality and weight could be raised less than a third cheaper on skim-milk with the addition of peameal, ground maize, or linseed-oil cake than they can be produced on butter-fat, I would then say the extract quoted was good advice to the farmers.

3. BUTTER-MAKING.

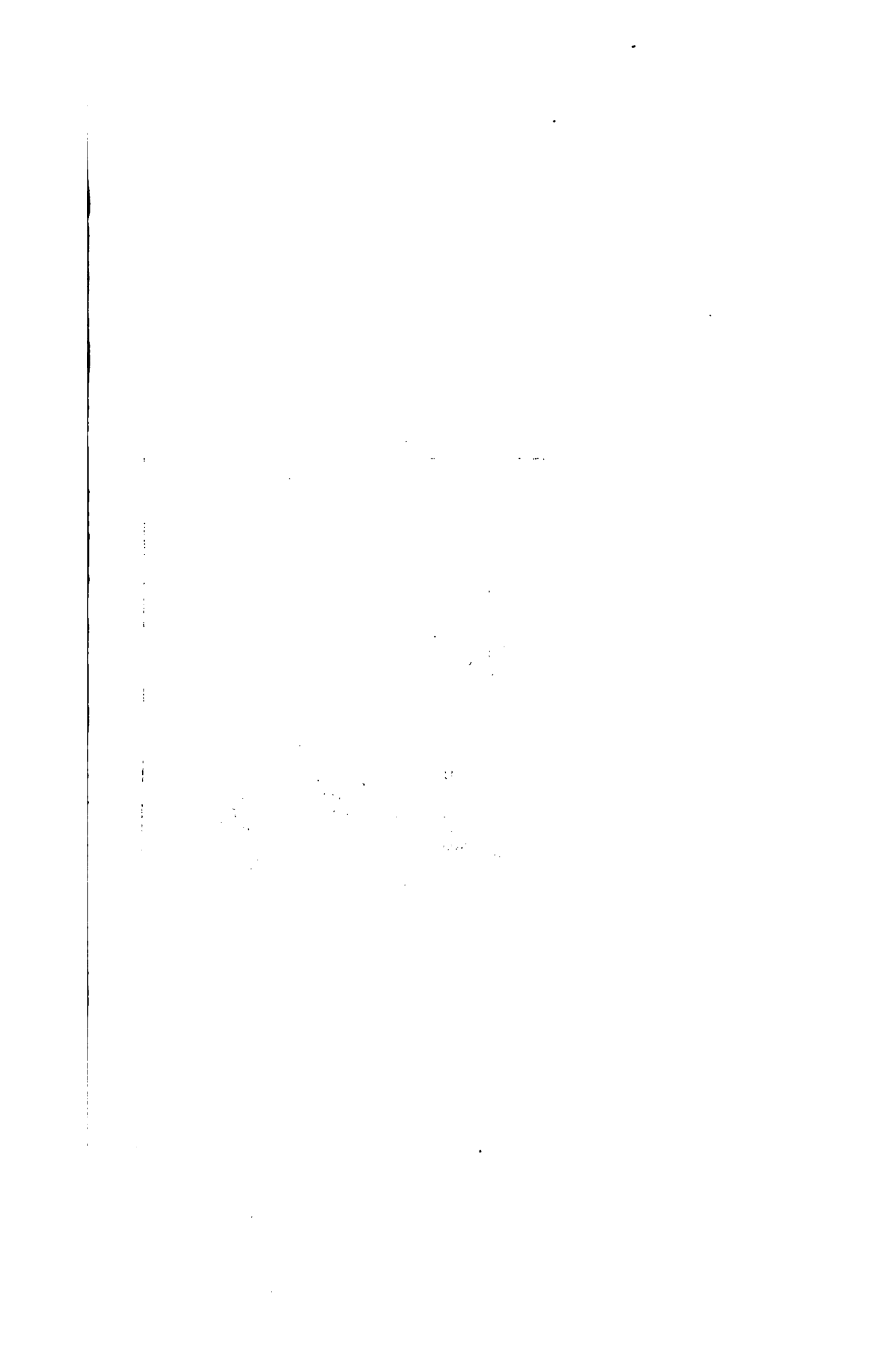
So far as the actual work of butter-making in the Argentine is concerned, the system adopted in most factories is somewhat different from ours in New Zealand. The bulk of the cream at most factories comes in in what I would call an overripe condition—that is, for the butter-maker to have control over it, or, in other words, for him to be able to ripen it uniformly with a good starter.

The fact of the cream arriving at the factories in this condition may be accounted for by the following reasons: Firstly, dirty milking-yards; second, dirty milkers; third, dirty, rusty cans. And the most dangerous source of infection, in my opinion, is the carrying of milk and cream long distances by rail in these rusty cans. A great deal of the milk is brought to the creameries in small cans on horseback. Large quantities of cream are also brought to the railway-stations from the small estancias or farms in this same manner. It is an astonishing thing to see a native coming to a small siding or station with six or eight cans of cream slung from each side of the horse's back. They also very often take double that number of empty cans back with them.

Very few saddles are used by the natives in the Argentine. They have a sort of home-made arrangement which is composed of heavy bands around the body of the horse, and the top of which is made of strong leather; two rolls of some material covered with leather are faced on each side of the centre of the horse's back, and a large hook on one side, which permits of hitching the horse to a load of any kind by means of a chain or rope—a very handy arrangement indeed.

New Zealand dairymen will understand that this is not a good system of conveying milk or cream to a butter-factory or skimming-station after reading my remarks on the methods adopted for churning butter for city and suburb supply.

Now, getting back to the butter-making process again: I found that the grading of cream would hardly be possible, for the reason that you get so many hundred different qualities of cream at all degrees of ripeness, particularly at a large factory like La Union, where they turn out in the flush of the season about 20 tons of butter per day, and where they get the cream in from over fifty separating stations, mostly by rail, besides the many small estancias that forward cream direct. The grading and ripening of cream with a starter in the Argentine is therefore not practised very much. In most of the factories, with the exception of two or three, the cream is allowed to ripen on what might be called the self- or chance-ripening system. Most of the factories are substantially built and fairly well equipped. The large factories have any amount of freezing-





BUTTER-FACTORY AT TANDIEL, ARGENTINE, OPERATED BY
MR. HENRY REYNOLDS.

capacity. The chilling of the cream is done by means of movable coils, through which cold water or brine is circulated. The vats are in nearly every case shallow, and the coils are worked up and down in the vat perpendicularly, not, like most of ours, on the horizontal principle. Generally speaking, the cream is not churned at nearly as low a temperature as we work on in New Zealand, the result being loss of fat in the buttermilk and injury to the texture of the butter in the working process. Most of the Argentine butter which I examined, both in the country and on the African markets, had the appearance of being overworked, and I was thoroughly convinced of that point after watching the process in some of the large factories. The Argentine butter is much paler in colour than the New Zealand article. This may be accounted for partly by the food eaten by the cattle, and perhaps the breed of cow may have something to do with it. Then, also, the large amount of friction given the butter in the working process tends to grease it and make it, as it were, have the appearance of hog's lard. A good deal of the butter exported is not salted. This latter is even paler than the salted butter. I have, of course, always found from experience that salt adds a little colour to the butter. While in Cape Town and Durban I learned from a number of dealers that the Argentine pale butter was very well thought of. It, however, only required a glance to see that New Zealand butter was the finest-made butter sent into Africa, but the mistake was that they did not get it there while it was newer.

I am in hopes that we may by experimental work get some method of reducing the high colour in our butter without ruining the body and texture, as the British expert buyer thinks so much of the latter. My advice to New Zealand producers in the past has been rather against the manufacture of unsalted butter in large quantities for export, on the grounds of the greater liability of deterioration in transit during the long voyage, as compared with fifteen days from the Argentine or a few days from Denmark. The Argentine is differently situated and can afford to take the risk, for the reason that they can land their butter in London in such a short time compared with the time it takes our butter to reach the British consumer. This month (April) there is an arrangement being entered into which will enable the producers in the Argentine to land their butter in London in fifteen days, so when they get such a quick fortnightly service as this they can lay their butter down in the Old Country in a fairly fresh condition as compared with ours. The butter-boxes are not so good in the Argentine, the timber not being so suitable. Like the Canadian boxes, the sides, bottoms, and covers are often in three pieces, tongued and grooved. The Argentine people, however, have paid more attention to the question of making the boxes for the African market of much heavier timber, and also to nailing them better. I commented strongly on this matter when dealing with New Zealand butter shipments in my African report.

During my hurried visit to the Argentine I had the pleasure of visiting two butter-factories controlled by Lovell and Christmas and Mr. Henry Reynolds. The latter manages the business, besides buying from other factories for export. Mr. Reynolds was one of the pioneer dairymen in the Waikato, Auckland Province; he has also the honour to be among the first to start butter-factories on what could be called a good sound factory system in the Argentine. The first factory visited was the Progreso, in the City of Buenos Aires. This factory is quite close to the railway-station, which makes it very convenient for receiving cream. It is equipped with a good plant and plenty of freezing-power.

At the time of my visit there they were turning out about 5,500 lb. of butter per day.

The other factory controlled by Mr. Reynolds is situated at Tandil on the Southern Railway. I had the pleasure of spending a few days at this factory along with the manager, Mr. Gerlach, who at one time resided in New Zealand. At the time of my visit this factory was turning out about the same quantity of butter as the Central Factory at Progreso, in Buenos Aires, where the whole of the business is transacted. The factory at Tandil is a fine building, equipped with a good plant. The boiler is of Italian make, 80-horse power, fitted with a fuel-saving condenser, which permits of the water entering the boiler almost at boiling-point. Mr. Reynolds informed me that this boiler was installed at a much lower cost than either an English or American boiler. They have also a very powerful engine and two Linde freezing-machines. Four large churns are placed in a row in the butter-making room. They are of American make, well known to me, called the "Squeezer." The butter is churned, worked, and salted in the churn. The cream is elevated into shallow vats, where it is cooled down by means of movable coils on the same principle as that in use at the Central Co-operative Factory at Christchurch. Although this factory was turning out less than 3 tons per day at the time of my visit, it has a capacity of 10 or 12 tons per day. In connection with the capacity question, I find the very reverse in the Argentine from what I have experienced in New Zealand—viz., that instead of building the factories too small to cope with even the second year's business, they build and equip for about four times the first year's capacity, and I believe it pays in the end.

Although they ship the butter regularly to the central factory at Buenos Aires, they have a freezing-chamber capable of storing 2,500 boxes of butter in case of emergency. Although Mr. Reynolds has been in the country for about five years, he does not seem to give his pointers on butter-making away to his opponents. I found the system adopted in his factories more on the lines of New Zealand butter-making. In referring to Mr. Reynolds's business I cannot pass without stating that I am deeply grateful and very much indebted to him for his kindness to me during my stay in the Argentine. Mr. Reynolds did not spare time or money to assist me in gaining information; he was also able to secure passes over one of the railways for me.

The most important factory in the Argentine, and perhaps the largest butter-factory in the world, is La Union Argentina, which is situated in the City of Buenos Aires. The cream comes into this factory from three different provinces—viz., those of Buenos Aires, Santa Fé, and Entre Rios. This factory in the flush of the season turns out about 20 tons of butter per day. At the time of my visit, in March, they were making close on 16 tons of butter per day. Cream is received from over fifty skimming-stations, besides the large number of estancieros who send their cream in direct to the factory. The skimming-stations are, generally speaking, pretty well equipped, but not properly managed so far as close and careful skimming is concerned. The separators used in the Argentine are of the Alexandra make, the Sharples Tubular, the Baltic, and a very few Radiators. The Alpha De Laval predominates in the Argentine, but so far as I could learn the tubular Sharples machine takes a lot of beating. La Union Factory is fitted out with an enormous amount of steam, engine, and refrigerating power. The freezer is of about 50 tons capacity. The boilers are upwards of 100-horse power. Eight large trunk churns are installed; the churns are practically the

same as those in use in New Zealand. The butter in the butter-making room is worked by two enormously large circular butter-workers, and they work four times as much butter at one single working as we do in New Zealand.

After taking careful note of the building and plant of La Union I came to the conclusion that with very little extension of the butter-making room nearly double the quantity of butter could be turned out with the present boiler, engine, and freezing-power. In other words, in order to make 35 or 40 tons of butter per day the extensions need not be on a larger scale or very expensive. In La Union they have splendid freezing and chilling chambers, which are capable of holding large quantities of butter in case they need to store at any time.

In 1902 this company issued an illustrated pamphlet in Spanish, giving a description, or, rather, the history of the company. I have much pleasure in quoting a few particulars from this pamphlet. They estimate in connection with this concern the rent of one cuadra (150 square yards) of camp land at \$15 per annum. The care and milking of 120 cows requires three practical men. The wages of each man is \$35 per month, with board and lodging. Ninety-five per cent. of the cows are of a Durham cross and type. Taking as a base the production of 13,000 kilos. per day already reached by the company, the following data will show the importance of the establishment: The daily output represents 312,000 litres of milk obtained from 81,000 cows, the value of which is \$5,265,000, and the rent of which amounts to \$800,000 per annum. In the dairies contributing to the production of the society are employed 2,025 men. The management and staff of the factory and branches is composed of 156 employees.

The above company was registered in June, 1899, statutes reformed in October, 1901; capital, \$500,000 in 5,000 shares of \$100 each. No shareholder can hold more than 100 shares. The business is conducted on co-operative lines. In 1901 the company acquired the rights and properties of the Compania Escandinavia Argentina (Limited). The directors are Señor A. Yrazu, president; G. Munoz, manager. The vice-president is Señor Agustin de Uribe. The board of directors is composed of eight directors in addition to those already mentioned; amongst them are Dr. Augusto Tiscornia and Señor Martin Pezoimburu.

I wish to express my thanks to Señor Yrazu, the president of the company, for his kindness in showing me over the whole premises.

It is claimed that the increase in the production of butter in the Argentine between 1891 and 1901 was over one hundred and fifty fold; in Australasia for the same period, according to Mr. Bateman, it was only thirty fold. In 1891 only 1,320 kilos. of butter was exported from the Argentine, while in 1902 4,125,000 kilos. was sent abroad.

Most of the cream is purchased on a commercial butter basis; that is, the estancieros have not become educated to accept so much per pound of butter-fat according to test. They demand so much per pound of butter, with 10 or 10½ per cent. added to the Babcock test, whether the manufacturer can turn out sufficient commercial butter to correspond with the test or not. This, in my opinion, is a wrong and unfair basis of carrying on a dairy business from the manufacturer's point of view, for the reason that a large quantity of the Argentine cream is injured in transit, thereby rendering it impossible to get a decent overrun. We in New Zealand think we have trouble with the testing and with our suppliers, but I believe we have the finest system of testing and paying for butter and cheese in the world; further, I think we have the most con-

tented lot of factory-suppliers I have ever seen. In the Argentine nearly every large estanciero has a milk-tester. The one in use all over the country is the Gerber. The client sends in a slip with his cream each day, giving the test as made at the estancia, and if the factory's test does not come up to this there is trouble. They, of course, do not take into consideration the obsolete methods of carriage, &c., which the cream is subjected to, which nearly always causes the cream to become partly churned, and which renders it impossible for the butter-maker to get a 10-per-cent. overrun according to the farmer's test. I have almost become disgusted with articles appearing in dairy papers with reference to 16 to 19 per cent. overruns. When overruns of this kind are made there is, in my opinion, as a rule, cheating in the weighing going on, and too much water and salt left in the butter.

In the Argentine, where the farmers or estancieros do not possess plants of their own, they deliver their milk to the nearest skimming-station. Then, again, where the cream is skimmed or raised by deep setting for account of the senders, or is purchased outright, in either case it is carted or railed to the factories at large cost for carriage. I have no idea when the proper system of payment for milk will be adopted in the Argentine—that is, by paying on the butter-fat basis. It is estimated that there are about two hundred and twenty skimming-stations in the Argentine Republic, where skimming by centrifugal machines is done.

This business covers four provinces—Entre Rios, Buenos Aires, Santa Fé, and Cordoba.

In dealing with the dairy industry of the Argentine I have endeavoured to refrain from making comparisons between it and New Zealand and Australian methods. I reckon that it is my duty only to give the true practical facts as near as possible as I found them, and then to let our farmers and dairymen make the comparisons and judge for themselves as to what this enormous country is capable of doing in dairying and what we have to compete against. It only requires a run over the various lines of railways to convince a person of the enormous extent of the country and its vast richness. On each side of the different lines you will see thousands of fat cattle and sheep, and it must be remembered that at the time of my visit it was their autumn, when one would expect to find the grass partly dying out; but so far as I could see the pastures were in excellent condition, and late crops on the grand fields of alfalfa and maize were indeed a sight.

One can imagine the carrying-capacity of the Argentine when it is realised that the province of Buenos Aires alone is two and a half times as large as the wonderful New York State in North America. It is estimated that this province alone has about 10,500,000 head of cattle, over 82,000,000 sheep, and about 2,230,000 head of horses. In 1901 the total value of agricultural and pastoral products from this province alone was \$740,000,000. We must, of course, figure on the fact that this province has a population of about 1,300,000 people. I am strongly of the opinion that if the people of the Argentine would adopt a better system of milking, yarding, and feeding the cattle, they would in a very few years turn out 50,000 tons of butter instead of 6,000 tons. While in the Tandil district I met a Mr. A. Leanes, who has had a lot of experience in dairy-farming in the Argentine. He is now on an estancia of 20,000 acres, and has a thousand cows. At the time of my visit he was milking between five and six hundred cows. He sends the cream



A CORNER OF A FLOCK OF SHEEP IN THE ARGENTINE.





THE HOME OF A LARGE ESTANCERO AND STOCK-BREEDER, ARGENTINE.

to a butter-factory, and utilises the skim-milk for pigs, &c., on the farm. Señor Leanes informed me, upon inquiry, that the value of his land was about £2 10s. per acre, and he further stated that two acres of the grazing-land would carry one cow—that is, the year round. This land is situated about two hundred miles south of the City of Buenos Aires. I found it almost impossible to get from a farmer or estanciero the exact profit made per cow on the estancias.

4. CASEINE.

I was not surprised to find that caseine was manufactured in fairly large quantities for export in the Argentine when I saw that little or none of the skim-milk was fed to the calves. As pointed out at the beginning of this article, the Argentinos prefer beef to butter-fat, or, rather, prefer raising the calf on butter-fat instead of skim-milk and meal.

I visited the large estancia owned by Dr. Santamarino, at Tandil. Tandil is 210 miles from Buenos Aires, on the Southern Railway. Near the Town of Tandil is one of the great sights or curiosities of the Argentine Republic—viz., the "Rocking-stone." This stone weighs thousands of tons, and sits on a small pivot. To prove that this great rock moves, all you require to do is to place a bottle under it, when it will be smashed by the slight rocking of the stone. It is said that one of the old Presidents at one time undertook to pull this marvellous rock off its perch by hitching four hundred bullocks to it, but the trial was not a success.

Coming back to Dr. Santamarino's business, which is situated near the Rocking-stone, I must say that this is a very interesting estancia. We should call this a "large ranch" in the northern United States of America, or a "run" in Australia. The estancia is over four square leagues in extent. In 1901 they installed separators in a factory at the homestead. At the time of my visit they were working five separators, and over 15,000 litres of milk per day was separated. In the flush of the season between four and five thousand cows are milked. They are also adding about five thousand more to the herd, all of which are already tamed for milking. On this large estancia there are thirty "tambos" or stations. Each one of these "tambos" is well fenced and watered. They also have paddocks of maize and lucerne. Besides, on each "tambo" will be found fairly good buildings. This sort of farm will sound large to our New Zealand people. It, however, requires enterprise and capital to carry on a business of that kind. Dr. Santamarino has also lately erected a large building and equipped same with an up-to-date plant for manufacturing caseine. He not only manufactures the skim-milk from his own herd into caseine, but many of the estancieros who have separators sell their skim-milk to him. Mr. Reynolds's butter-factory at Tandil also supplies a large quantity of skim-milk to the doctor's business. I was informed that the caseine fetches about £30 per ton in London. Coke is burnt for drying the milk, and the expense is not a very light one. The great trouble is to get details from such an experimental business. I would not recommend this system of dairy-farming in New Zealand, particularly the milking process. I am quite sure our New Zealand farmers can make a great deal more money by feeding the skim-milk judiciously to calves and pigs than by manufacturing it into a rough caseine for export. During the first quarter of 1903 80,000 kilos. of caseine was exported from the Argentine.

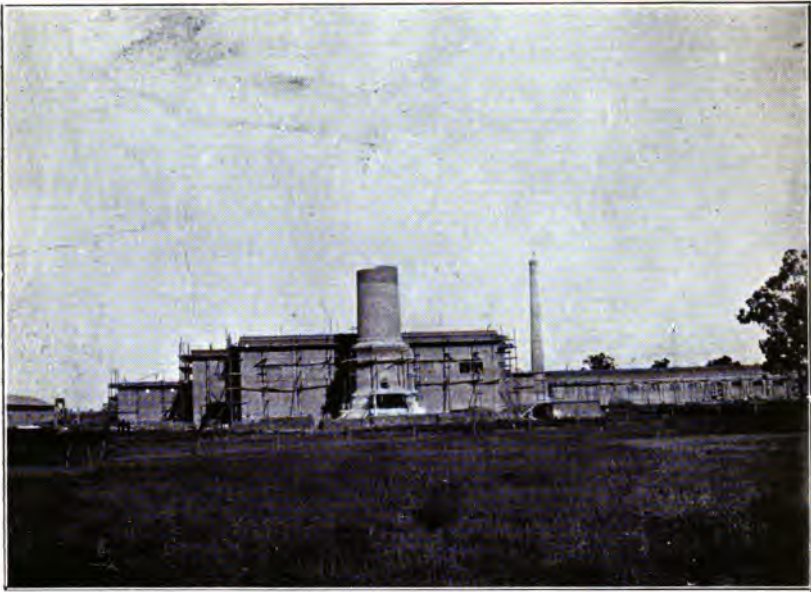
5. DRIED MILK.

The manufacture of dried milk is practically a new business in the Argentine. While in the country I visited Mr. L. Gahnan's estancia at Navarro, in the Province of Buenos Aires. A new plant has just been installed in Mr. Gahnan's butter-factory. A company has also been formed for the manufacture of dried milk in large quantities for export. At Mr. Gahnan's factory three machines with a capacity of 80 gallons per hour are set up. The machines are made by Lane and Co., of Edinburgh. The process is a very simple one. The machines are nothing more than two large steel cylinders, 20 in. or 22 in. in diameter and about 6 ft. long. These cylinders are set close together; when heat is applied, I should judge, with the expansion, they are only $\frac{1}{8}$ in. apart. They are heated by means of applying dry steam to the inside of the drums. The milk is delivered directly on to the hot cylinders by means of a perforated pipe, which throws a fine spray on to each cylinder; the high temperature causes a thin coating of milk to adhere to the cylinder, and while the latter is revolving the dried milk is shaved off by means of thin knives, which latter must be perfectly true and set close to the cylinders. The dried milk when it is being delivered from the cylinders has the appearance of very thin white tissue paper. These large sheets of milk if touched with the hand will break readily. This substance is received from the cylinders into two large boxes, where wooden mallets are used for breaking up the dried milk, which is afterwards passed through a fine sieve, in order, as it were, to size it. After being passed through the sieves the milk has the appearance of fine meal made from a light-coloured American corn. It is then filled in barrels exactly like a 200 lb. flour-barrel, which are lined with parchment-paper. The dried milk is then ready for export. Any New Zealand dairyman or others interested can see a sample of this milk at the Dairy Commissioner's Office, Wellington.

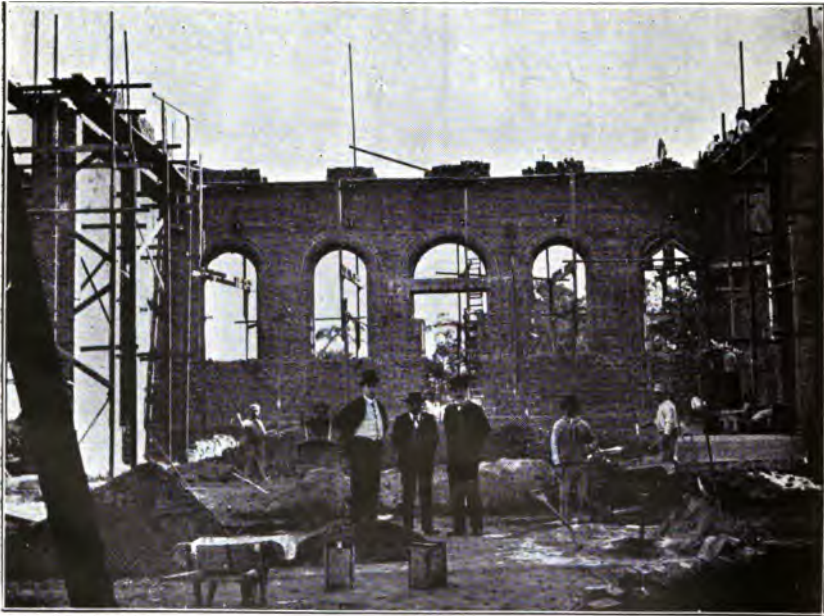
If this system proves a success, a milk which is so easily handled and shipped is almost certain to meet with a good demand, particularly in a country like South Africa. I may explain that the sample of milk to which I gave a trial test did not prove a success, for the reason that the caseine did not seem to dissolve, thereby leaving considerable sediment.

6. THE MEAT INDUSTRY.

One of the great industries of the country is "saladeros," which signifies salted or jerked beef factories. These factories also make extract of beef, &c. About \$45,000,000 is invested in this business. The principal market for this "tasago" or salted or jerked beef is found in Brazil. Before these saladeros were established the only exportable animal products were grease from boiled-down animals, tallow, and hides. Now they have fifteen or sixteen of these saladeros, and from statistics given by Señor Ronaldo Tidblom there were slaughtered at these institutions for making jerked beef 403,000 cattle in 1901 and 253,100 in 1902. It is also said that about 250,000 head of steers are sent into Uruguay and Rio Grande (Brazil) for the purpose of supplying the saladeros there. The total export of jerked beef for 1901 was 24,296 tons, and for 1902 22,304 tons. It is claimed that this jerked-meat industry cannot be done away with by the establishment of meat-freezing works, for the reason that Brazil and Cuba will always require and must have tasago. These countries also take leaner and lighter cattle for this purpose from the Argentine than those sought after by the freezers and exporters.



THE ARGENTINE MEAT INDUSTRY: COLD-STORES IN COURSE OF CONSTRUCTION.



FREEZING-WORKS IN COURSE OF ERECTION, ARGENTINE.

Although I am not an expert on meat-freezing works, I am going to give some practical facts with reference to what is being done in this, the greatest of industries in the Argentine. During my short stay in the Republic I was successful in getting through some of the most important freezing-works in the Argentine. The first freezing-works which I visited was at the Town of Campana, and by the kindness of Mr. Graham, representative of John Cook and Sons, I was able to get a look over the whole premises. This was the first meat-freezing works started in the Argentine, and dates back only to 1883. It belongs to the River Plate Fresh Meat Company. They have a killing-capacity of upwards of six thousand sheep and four hundred steers per day. This company also started the first export chilled-meat business to Great Britain in 1901.

The chilled-meat industry is becoming an important factor in the Argentine meat trade. The advantages in favour of chilled meat over either live cattle or frozen beef for export, as claimed by the Argentines, is that the price is higher on the British market than for frozen beef, and also that the expenses incurred in handling live-stock for export are much higher—that is, transport, &c. The River Plate Fresh Meat Company are now extending their premises. They have erected large buildings, where the sheep will be housed over night. This is found necessary owing to the fact that when it rains the sheep get wet and muddy, which makes the killing much harder and more disagreeable next morning. This idea might be adopted to advantage in New Zealand. These buildings or large sheds need not necessarily be very expensive.

At Campana they have a good wharf where the large Home steamers come alongside. The mutton and beef is taken direct from the freezing-chambers; where the small trucks are run right into the chamber, and during the loading a set of outside insulated doors are shut and opened to allow the trucks, which run on a narrow railway, to pass in and out. This scheme seems to work well. The steamer "Langton Grange" was loading a large shipment of beef and mutton at Campana at the time of my visit. This was being shipped by John Cook and Sons, of Australia. The chilled meat for the British markets is loaded in a similar manner, only, instead of having the trucks run to the wharf in the open, they have built a sort of insulated shed or tunnel, which protects the carcasses from exposure to the hot sun. This company owns large grazing paddocks or estancias, where the surplus stock are kept; also paddocks for resting the stock in close proximity to the works.

I may also mention that in connection with the chilled-meat business operated by the River Plate Fresh Meat Company in 1901 they exported 29,919 quarters of beef, and from the 1st to the 31st January, 1902, their exports were 38,148 quarters. Later figures I was not able to obtain. There seems, however, to be a rapid increase in the exports to Great Britain, and, from what one can learn from recent reports from London, this factor in the meat-market at Home seems to be alarming the Beef Trust of the United States and the Australian shippers. It is claimed by shippers in the Argentine that their meat is competing fairly successfully with the meat from the United States, and that they are in a position to lay it down in London cheaper.

The next freezing-works I visited, those of the Campana Sansinena de Carnes Congeladas, are the largest in the Argentine. Through the kindness of Mr. M. Leishman Runciman, of Runciman and Co., I was shown through this institution, and a marvellous place it is. It was started a year later than the River Plate Works, and has been many times enlarged and added to both in buildings and plant. This works

is situated at the Barracas, Buenos Aires. The Sansinena Company are canny about giving much information regarding the operating of their business. I was, however, able to see how they handle the sheep and steers during the killing process. At most of the works in the Argentine, including the River Plate Factory at Campana, they have a system of placing men at different jobs, such as carrying the sheep to the bleeding-benches, and others to do the bleeding. Then they are carried to the hooks, where they are skinned by a different man from the one who takes the internals out. The same is the case with steers—for instance, they have a special man for skinning and cutting the knuckle part of the leg, &c.

In my opinion, there seems to be too much handling of the sheep by hand in most of the works in the Argentine. I am also convinced that we have not much to learn from the Argentine so far as the killing of beef and sheep is concerned. The exact capacity of the Sansinena Works I was not able to get, but was informed that they had a killing-capacity of over seven thousand sheep and four to five hundred steers per day.

There are other important freezing-works in the Argentine. There is the Las Palmas Produce Company (James Nelson and Sons, Limited), which is a fairly large concern. Three new and important freezing concerns were started in 1902: one at Bahia Blanca, by the Campana Sansinena de Carnes Congeladas; also a new one, the La Blanca, at the Boco, Buenos Aires. This latter company only started operations in April last. They have a first-class works with an improved plant, and have a killing-capacity of four thousand sheep and three hundred cows or steers per day. The next works visited was the La Plata, at the Town of La Plata, on the La Plata River. This works was in course of construction when I was there. They are putting up enormous buildings and equipping the place with an up-to-date plant. From information received, and from the appearance of the various cattle districts in the neighbourhood of La Plata, and also the thousands of fat cattle one sees in this part of the country, I am of the opinion that this works may become one of the most important in the republic. Mr. C. A. Macdonald, owner of the Hercules refrigerating business in Australia and South Africa, was installing three large freezing-machines at the time of my visit. These three machines will have a capacity of 120 tons each. Mr. Macdonald is also installing three Hercules machines of enormous capacity in a new freezing-works on the River Plate, quite close to the City of Buenos Aires. Mr. Macdonald has had the planning of this latter works, and I think it is the finest laid-out or designed works in the country. The engine and freezing-room is going to be the most complete I have ever seen. In connection with these works they have erected an enormous building where the hides will be treated by different processes. This hide and fellmongery department will be in charge of an expert from Germany. To see the great smokestacks in course of erection at these new works would give one the idea that the company intend doing some business. After travelling for a few days in the Argentine I came to the conclusion that it was the country of smokestacks. Often you will see in the distance a great stack towering high in the air, and upon inquiry you may be informed, "Oh! that at one time was a boiling-down works," or perhaps it might be a brewery or a soap-factory. Before leaving the question of the last two new works just described, I wish to express my deepest appreciation of the kindness extended to me by Mr. C. A. Macdonald and his son during my stay in the republic.

To see the millions of fat cattle dotted all over the country, and such

an abundance of grass and water late in the autumn, I could not help but think that some day the Argentine will down the world in the growing of beef. According to figures given in the Year-book, the Argentine is working under better conditions in the growing of live-stock than any of the British colonies. It is claimed that at present the majority of the freezing companies are working with much less expense in the administration, &c., taking it the year round, and their output is much greater, thereby enabling them to pay in proportion enhanced values to the estanciero (farmer). Another strong point in favour of the Argentine estancieros is that they work steadily throughout the whole year, whereas according to statistics the upwards of fifty stations in the British colonies are only able to work on an average, taking them all round, a little over one-third of the year. So enormous is the business of growing fat stock in the Argentine becoming, that it is estimated by reliable authorities that within very few years they should be able to export two million steers either alive or through the freezing-works.

In order to give our people some idea of what they have to compete against, I quote the following figures from the Argentine Year-book for 1902 and 1903: In 1902 the exports of cattle or steers from the Argentine was 118,303 head. The number of cattle exported in 1903 is said not to vary much from 1902. The number of wethers shipped in 1902 was 122,501; horses, 16,008; frozen mutton, 80,073 tons; sheep-skins, 41,405 tons; salted cow-hides, 35,343 tons; dried cow-hides, 26,558 tons; salted horse-hides, 135,685; dried horse-hides, 282,138; wool, 197,936; jerked beef, 22,304; frozen beef, 70,018; tallow, 49,095.

I have much pleasure in quoting a few of the statistics just issued by the Ministry for Agriculture for 1903—that is, so far as the meat industry is concerned. The principal exports in this industry were frozen sheep and lambs, 2,445,993; frozen beef, 84,628 tons; wool, 192,989 tons; sheep-skins, 41,475 tons; hides, 37,239 tons; horse-hair, 2,241 tons; tallow, 39,000 tons. The bulk of the frozen meat in 1903 was shipped to the United Kingdom and South Africa, but most of the wool went to France. The sheep-skins went to Germany, Belgium, and the United States, the bulk to the two former countries. The value of the wool exported from the Argentine in 1903, estimating it at \$2.61 gold per 10 kilos., was \$50,424,168 gold, or, say, over £10,000,000. Last year 1,202,100 cattle were slaughtered for dried beef. In addition to this; 269,000 were slaughtered for making extract and preserved beef.

I landed in the Argentine in February, and I noticed that the exports of frozen sheep and lamb for the previous month, January, were 194,731 carcasses, and of frozen beef 72,150 quarters.

It may be interesting to New-Zealanders to know the conditions under which men may start pastoral farming. I now speak of people with a small capital. The landowner, as a rule, provides a house, pens, and the necessary fittings, and camp land sufficient to carry stock and 800 sheep. The shepherd or estanciero buys a further 800 sheep. He takes charge of the whole flock and provides his own food, mutton excepted, which is to be taken from the flock. Whatever the profit from the flock may be it is divided equally between the landowner and the shepherd, after deducting the shearing and dipping expenses, which are advanced by the landowner. The shepherd or farmer is allowed to plant vegetables required for his family, also to keep poultry, milch-cows, bees, &c., and he can also plant fruit-trees. Contracts of this kind are generally entered into for a term of three years. At the end of each year the produce of wool, wethers, sheep, and skins sold is divided. The increase is divided at the

end of the contract, when the shepherd may either take his share or capital in sheep, or renew his contract. The necessary capital for such a plan as this is very small: 800 sheep at \$1, \$800; six horses at \$15, \$90; furniture, utensils, and general expenses for first year, \$250: total, \$1,140. With this capital, and with sheep shearing $5\frac{1}{2}$ lb. to 6 lb. of wool, the shepherd's portion of the profit may be estimated at from \$450 to \$550, without counting what he could make from butter, cheese, poultry, honey, &c.

The State lands which are available for sale or for renting, as given by the 1903 Year-book, number nearly a hundred million hectares, situated as follows: In Santa Cruz, 24,949,976 hectares; Chubut, 22,545,742 hectares; Rio Negro, 15,087,470 hectares; Chaco, 13,025,450 hectares; Neuquen, 6,174,158 hectares; Formosa, 8,676,180 hectares; Pampa, 3,124,802 hectares; Tierra del Fuego, 1,886,809 hectares; Misiones, 792,000 hectares: total, 96,262,487 hectares.

Seventy-five per cent. of the wool in the Argentine is of white-faced long-wool sheep (Lincolns and Leicesters), 20 per cent. of merinos, and only about 5 per cent. of black-faced and criollo sheep.

In 1901 228,358 tons of wool was exported, and in 1902, 197,936 tons. In 1903, 192,989 tons was exported, most of which went to France and Germany. I have seen a great many fine flocks of sheep in the Argentine, and some of the breeders pay extraordinary prices for stud stock at Home; notwithstanding this, and the fact also that they have such an excellent climate for the breeding of animals, their sheep on the whole, in my opinion, do not compare with best New Zealand and Australian sheep. You will, however, find some of the best stud stock that is to be found in any part of the world. Owing to the fact that my stay was such a short one in the republic, it was impossible for me to collect much practical information direct from the sheep-farmers—that is, with reference to the actual methods of handling sheep on the estancias.

7. AGRICULTURE, STOCK, AND GENERAL.

When one travels over a portion of the Argentine, a country only one-third the size of the United States, he sees its immense plains formed by Nature, with a climate perhaps the most comfortable and salubrious in the world taking it the year round. It is a country also where railways find no natural obstacles in the way of their construction. You find on the Pacific Railway plains the great estancias (ranches) covered with fat steers and sheep. The latter, I may say, are to be seen in millions. Amongst the cattle I can safely say thousands are of the best breeds. You also see the great fields of linseed, corn (maize), and wheat, the principal agricultural products of the country.

The size of an estancia, or what we should call a "run" in New Zealand or a "ranch" in the United States, varies from 3,000 to 600,000 acres. About 20,000 acres might be said to be an average estancia. In conducting the business of cattle-herding or ranching in the Argentine, that is where cattle are raised and fattened for export, it requires expert men. These men in the Argentine are called Gauchos. They are, so far as riding and the care of cattle is concerned, similar to our cowboys in the North-west Territories of Canada, where they can lasso or tie up a wild steer or horse in lightning style without getting out of the saddle. The horses, generally speaking, are small-sized, but wiry and of marvellous endurance. They somewhat resemble our Canadian mustang horse. The cattle roam over the great plains, and many of the estancias

are not fenced. It is therefore necessary to brand the cattle. They have an exhaustive set of branding regulations, which time and space would not permit of my detailing in this report.

In my opinion the republic is favoured with a combination of advantages over many other, or, perhaps, over almost any country in the world. I am still further of the opinion that if the Argentine agricultural and pastoral industries were developed on anything like up-to-date lines, within very few years they would be able to land their products on the markets of the world almost beyond competition. People may ask, Why? I say then that the above statements may be backed up by the following: First of all, perhaps, the success and future progress of the Argentine, so far as agriculture is concerned, may be credited to her geographical position or situation, and also to her favourable climatic conditions. Then there is the marvellously low price of land, and the fact of her being able to make use of labour on the land the year round. Next is the growing of alfalfa, of which four to six crops are often cut, the latter in the best districts. The Argentine also has the advantage of having cheaper labour than such great producing countries as Canada, United States, Australia, and New Zealand. It has, further, the advantage of breeding and the carrying of cattle for dairying purposes, and also of fattening its live-stock the year round with little or no extra feed. It has also the advantage of having lower ocean rates to the principal markets of the world than Australia and New Zealand, and only about 25 per cent. higher than North America. The Argentine also has the advantage of having an unlimited mileage of railway, which enables her to land her products at the ports of shipment at a very low cost. Then, again, severe droughts are almost unknown in the Argentine, and the pests which we hear so much of in our colonies, which it is claimed do so much damage to crops and pastures (such as the locusts), are, in my opinion, not nearly so bad as they are made out to be, and there is no immediate cause for alarm from this source. The Argentine Government has ever since 1897 taken the most energetic measures to prevent the invasion of the crop districts by these pests, and has been very successful. They have spent \$11,000,000 gold in this direction, with the result that in 1898 95 per cent. of 68,000,000 hectares was saved from the scourge, and in 1901 and 1902 they almost entirely eradicated the plague. About three-quarters of the soil in the arable districts is composed of alluvial deposits of volcanic and granitic origin, making the soil fairly light, porous, and free from stone, which makes it easily worked. The soil in most districts is strongly covered with vegetable deposits. It rests on a subsoil which varies from 25 centimeters to 1½ meters.

8. WHEAT-GROWING.

It was at one time the opinion of scientific men that the pampa soil of the Argentine was not very suitable for agriculture, particularly for the growing of a good quality of wheat. That idea, however, has long since disappeared. Excellent specimens of wheat can be seen all over the country now. There are many varieties of wheat grown, but probably the best suited to Argentine soil is the "Barletta." Some tests have been made where it was found that this variety gives a weight of 83.250 lb. per hectolitre, while one of the best Russian varieties weighed 84.500 lb. per hectolitre. One must take into consideration the vast extent of the wheat districts of the great Argentine territory in order to realise that it is necessary to procure that particular seed which may be best adapted

for the district he may be farming in. Want of knowledge in this direction is said to have caused serious deterioration in the quality of wheat in some provinces, particularly in the noted wheat province of Entre Rios. In the southern parts of the Argentine splendid results are said to be had from Hungarian and Russian varieties; those along with the first-mentioned, Barletta, seem to be very suitable for export.

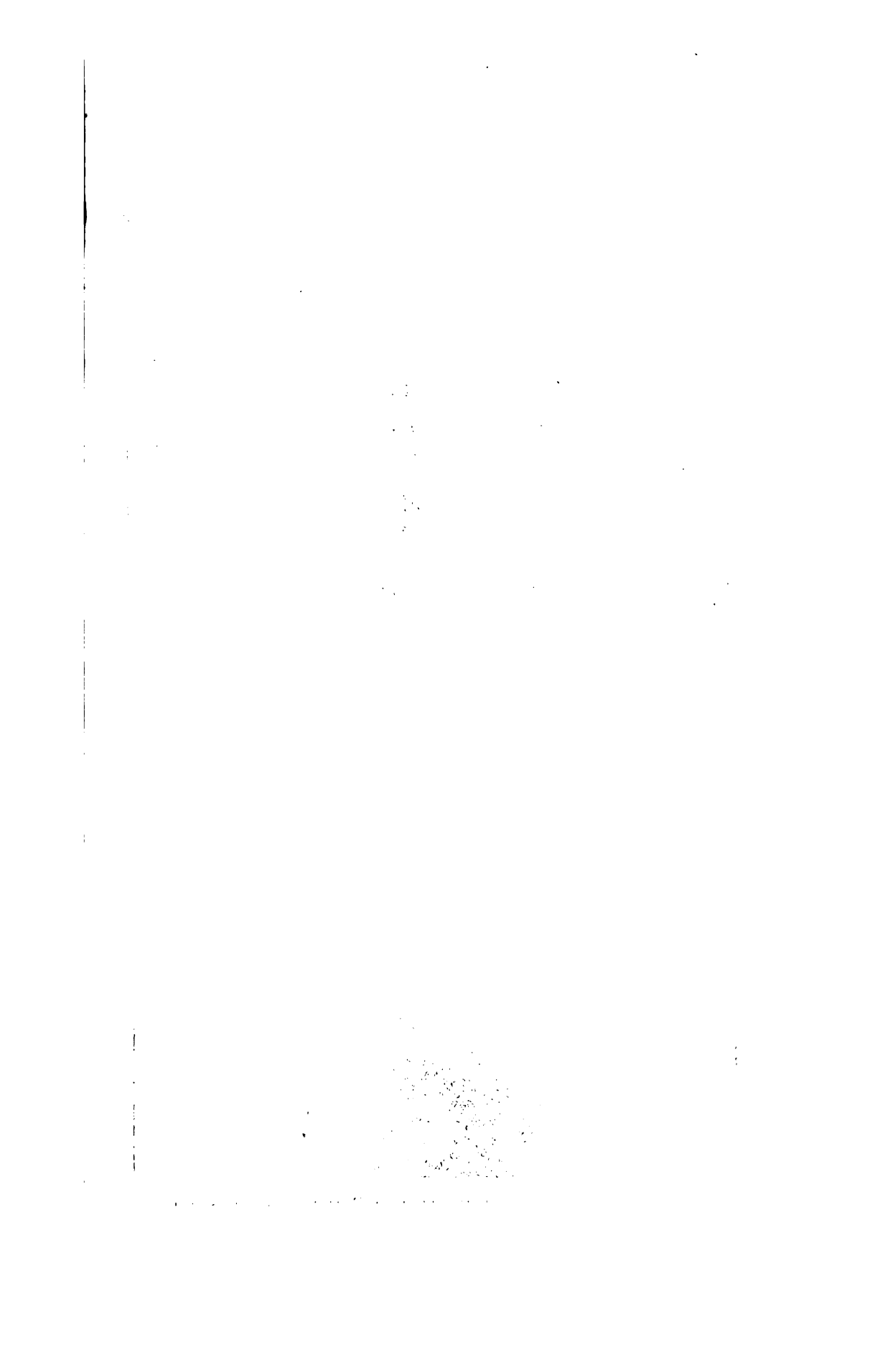
In the southern parts of the republic you find a colder climate, which, perhaps, tends to make seed imported from colder climates do better. It is said, however, that excellent large, plump, bright seed from Manitoba, in Canada, and also magnificent seed from California does not do well in most districts. I have also learned from old Spanish wheat-growers that such excellent imported seed only requires a few seasons until it degenerates into a shrivelled-up inferior product; while, on the other hand, the best varieties of native grain which are suited to the different provinces seem to give general satisfaction both for milling purposes and for export. Among the varieties grown are to be found some French varieties, which are much in request for home consumption, but are not sought after by the British importer.

Before dealing briefly with a few practical facts as regards the actual practice of wheat-growing by the natives in the Argentine, I beg to quote a few statistics which I consider to be as reliable as can be obtained in the republic, seeing that they came from the Ministry for Agriculture and the latest Argentine Year-book. I suppose the largest harvest the Argentine ever reaped was in 1898 and 1899, when they exported over two million tons. Besides the exports, 1,750,000 tons was used for home consumption and for seed. According to the latest figures issued by the Ministry for Agriculture, the total wheat-production for 1903 and 1904 was 2,750,000 tons, of which 1,681,000 was exported. Besides this, 71,980 tons of flour was exported. The home consumption of wheat in the Argentine is now over 700,000 tons per annum. The quantity of maize produced by the Argentine will sound large to New-Zealanders. Last year she grew no less than 3,770,195 tons. In 1903 and 1904 there were under wheat alone in the Argentine something over 4,300,000 hectares. In the District of Tres Arroyos there is upwards of 150,000 hectares under wheat, and during my visit there I was informed that 40,000 hectares was recently purchased from the Government for agricultural purposes by one firm alone.

The cost of cultivating 100 hectares according to the latest statistics is found to be as follows: This crop gives twenty bags of 70 kilos., or about 1,400 kilos. to the square: For ploughing, \$300; harrowing, \$100; two ploughings, sowing, overseer, &c., \$400; two extra harrowings, \$100; 6,000 kilos. of seed at \$5.50 per kilo., \$330; interest on capital, depreciation, and payment of labour, \$70: total cost, \$1,300.

Speaking generally of the various provinces as wheat-growers in the Argentine, the Province of Buenos Aires contains the best land. This province is being rapidly opened up for agriculture. The centre part of the province is largely adapted for sheep-farming. The Province of Entre Rios lies near the River Parana and Uruguay. This is a great country, having vast rolling plains, and many small rivers, and some woods in places. This will also some day become a great wheat province, owing to its having such rich soil.

The Republic of Uruguay, although I did not get a look over it, is said to be coming to the front as a wheat-producing colony. This republic is controlled by an entirely different Government from that of Buenos Aires and the other provinces. I may add that this republic is

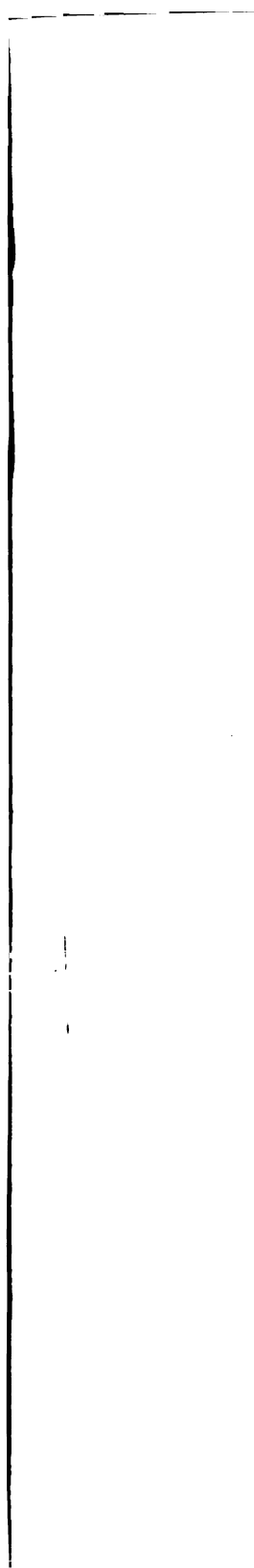




A NEW STATION AND WHEAT-ELEVATORS IN ONE OF THE NEWLY SETTLED DISTRICTS, ARGENTINE.



TIMBER AND WHEAT BEING DELIVERED AT A PRAIRIE RAILWAY-STATION. ARGENTINE.





WHEAT STACKED READY FOR SHIPMENT, ARGENTINE.



NATIVES HAULING WHEAT TO A RAILWAY-STATION, ARGENTINE. (NOTE THE WAGON-WHEELS,
8 FT. IN DIAMETER.)

noted for her frequent rebellions. Uruguay produces about 800,000 quarters of wheat. In that republic they have always maintained a gold currency.

Ploughing is done in a very rough, slovenly manner in most places in the Argentine. A Canterbury farmer would be scornful if he watched the ordinary "chacero" Italian tenant following his bullocks as he turns the most crooked furrow imaginable, leaving much of the grass to be seen on the surface. It is said, however, by old farmers that there is sometimes wisdom in light working of the land, particularly during wet seasons. It is found during the wet seasons with deep ploughing the wheat grows very much to straw, whereas the shallow-worked land returns a good crop. This would appear somewhat of a lottery business in wheat-farming. Idleness during the growing of the wheat-crop seems to suit the Italians. While that is true, it may be pointed out that no country offers better advantages for carrying on mixed farming the whole year round. There is no time of year when a farmer could not if he wished be busily engaged in ploughing, sowing, reaping, or threshing either wheat, linseed, maize, or lucerne.

They have a good deal of trouble with smut in wheat in the Argentine. Frosts in the southern part of the country also cause damage some seasons. With old lands where wheat has been grown for fifteen to twenty years, and where no plant-food has been put back in the soil, the land becomes tired and foul or sour, thereby producing poor crops.

9. HARVESTING THE CROPS.

Generally speaking, the reaping is done in a very short space of time, for the reason that nearly every man, woman, girl, and boy works from early morn till late at night to save all of the crop before any of the grain is shed. Reaping-machines and horses are plentiful, but sometimes with a big crop labour is scarce.

Threshing is, as a rule, done by contract, and is begun as soon after the harvest as machines and men can be secured. Very often estancieros combine and purchase threshing-machines and do the threshing on a sort of share system, or, rather, on the co-operative principle.

The life of the Buenos Aires and Santa Fé wheat-farmer is, saying the least of it, monotonous, although I must say it is probably one of the healthiest climates in the world. Needless to say, the temptations of the ordinary estanciero to spend money are not great. They live very simply, but hardly ever does poverty exist. About the only amusement is playing the violin, guitar, or banjo. It is not a very pleasant feature for an Englishman to hear these Italian wheat-growers discussing matters among themselves when he does not understand them; but if you only get a twinkling of the language you become impressed with it. I know of no language except the Maori language which is so soft and sweet.

Getting back to the wheat business, which I wish to make as short as possible, I may point out that there are about three hundred and fifty railway-stations where wheat is shipped for export—that is, from the country districts. While passing I may mention that there does not seem to be much disposition to rapidly build up country towns, as is the case in Canada and the United States.

At the Port of Buenos Aires they have many enormous elevators on the principle of those at the head of Lake Superior in Canada, through which latter a vast portion of the wheat consumed in Great Britain passes.

At the Port of Rosario they have also large elevators. The difference between the methods of handling wheat in the Argentine and Canada is that in Canada, particularly in Manitoba and the North-west Territories, the wheat is never put in bags; it is delivered direct from the machines into large wagon-boxes, from which it is shovelled direct into the elevators, which are dotted all along the line at each small town or siding. The wheat is all classed or graded and placed in different compartments high up in the elevators, after which it is run directly into the cars at a small cost. It is then conveyed to the head of Lake Superior, where it is again run or elevated into these enormous sky-pilot elevators, from which it is delivered into the vessels without very much hand-labour.

In the Argentine all the wheat, as in New Zealand, is put in bags and stacked up at the stations until sufficient cars are available to carry it to the sea-ports. I have seen as much as three hundred thousand bags of wheat stacked up at one station in the District of Tres Arios awaiting transport. In many cases the bags are placed directly on the ground, without any straw or boards underneath. In the case of heavy rains a considerable quantity becomes damaged. This is said to be the fault of the farmer, but I say it is the fault of the Government, for during my stay in the republic large quantities of wheat were blocked at the various stations owing to a strike on the railways. This strike hampered trade greatly, but it was finally settled peacefully at a great expense to the farmers. During the strike I had several quaint experiences while travelling. Nearly every train was paraded by Spanish soldiers; what they were there for one could not tell, for although they had swords, bayonets, rifles, &c., no person seemed to be getting hurt, as would be the case in North America where the Militia is called out for a like purpose. Sometimes we would stop two hours and a half at a railway-station, for what purpose no person could explain; nevertheless we stopped.

The Spanish soldiers are a great body of men. They are all undersized; they wear a uniform which seems to have been specially designed by the Government to act as a target for any foreign foe. They have all sorts of shiny belts and shoulder-ornaments, and the most conspicuous of all is a very high cap, the top of which is a deep scarlet, thus making a grand target in time of war.

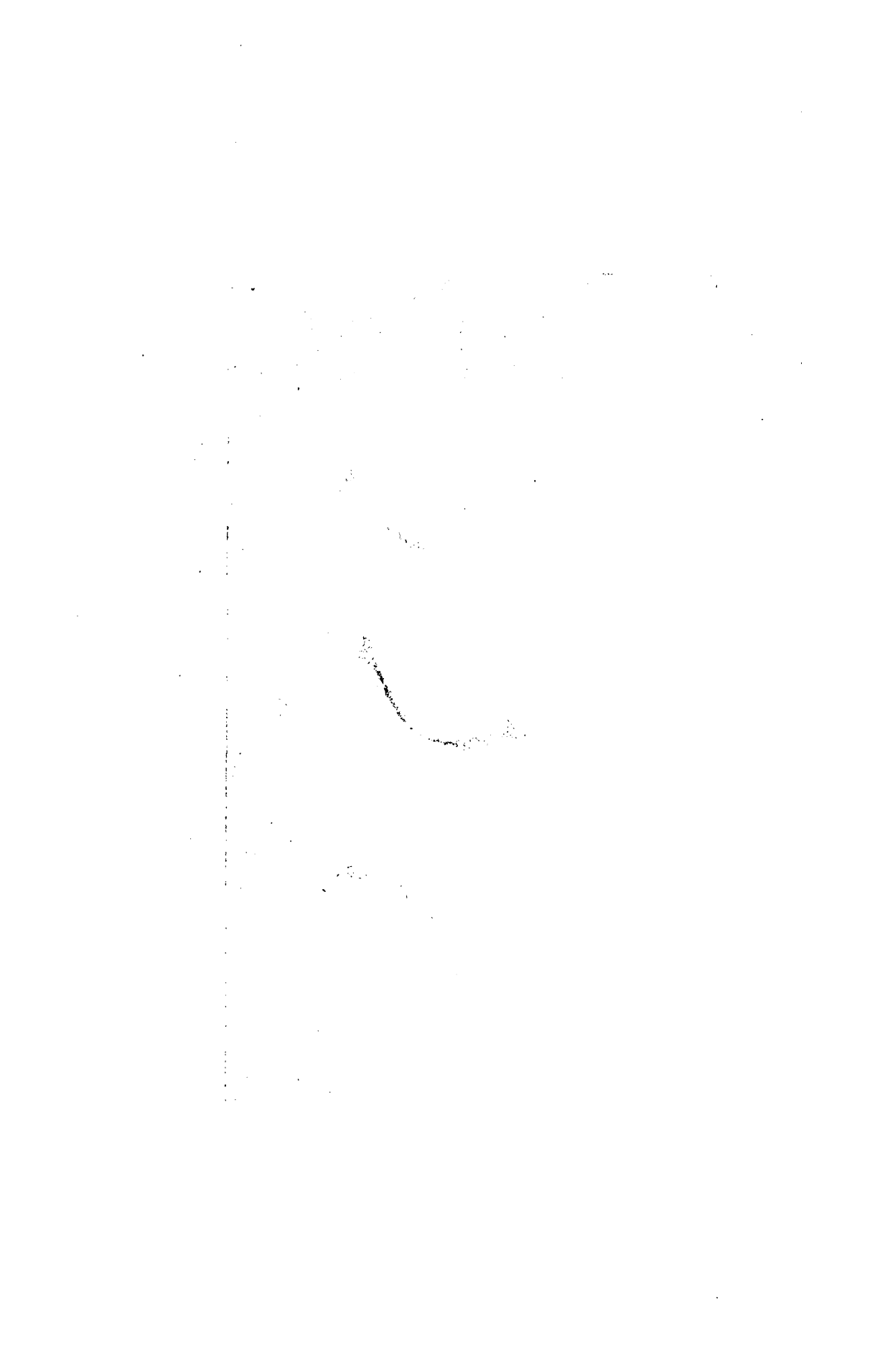
10. GENERAL.

A word or two about the money of the country, railways, &c., may not be out of place. The money of the Argentine is on the paper basis; the minimum value of a dollar was fixed about the year 1900 at 44 cents gold, or 127 per cent. premium. The value of one gold dollar expressed in paper money varies between \$2.27 and \$2.35. I may also point out that the gold dollar of the United States is at about 4 per cent. premium over that of the Argentine Republic dollar.

The great plains of the Argentine are well equipped with railways, and extensive developments yet continue on a large scale. It is said that back as far as 1867 there were only about 360 miles of railway in the country, while in 1900 there were 10,601 miles of these railways. The Government owns about 1,500 miles, and nearly 9,500 miles are owned by foreign companies. In length of line the Argentine stands about eighth on the list of countries. The paid-up capital is about \$500,000,000 gold. The total receipts, according to the Argentine Year-book for 1900, are over \$400,000,000 gold. There are three gauges in railways in the republic. One is a very wide line, being a 5 ft. gauge; it is really the standard



CROSS-COUNTRY TRANSPORTATION, ARGENTINE REPUBLIC.



throughout the country, although they have short lines with a 4 ft. 8½ in. gauge, and also a narrower gauge, similar to that in vogue in some of the out-of-the-way districts in the colonies, 3 ft. 3 in. (or 1 meter). I suppose one of the most interesting railway-lines in the republic, which is now nearly completed, is the Transandine, which touches the banks of the Mandosa River. This railway climbs to the summit of the pass of the Andes, which are over 13,000 ft. above sea-level. Speaking generally of the railways, they are well constructed, although it is a very difficult matter to get good ballast in such great plains as the Argentine, which are lacking so much in the necessary material—stone and gravel-pits. The cars are very much like those employed in North America. There are comfortable sleepers and fine dining-cars on all through trains.

The total length of telegraph-lines in the Argentine is close on thirty thousand miles. About twelve thousand five hundred miles of this belongs to the Government; the Western Union Company alone has 192,705 miles.

With regard to the general industries of the country, the main products are agricultural, while others are developing fairly rapidly. Sugar may be classed as an agricultural product; they have forty-one sugar-mills in the Argentine. In 1870 the Argentine imported 22,000 tons of sugar, while in 1899 the tables were turned, when she exported nearly 60,000 tons of sugar. It was estimated that there is about \$55,000,000 gold invested in the sugar industries in the Argentine.

They have sixty-two breweries in the republic, which brew about 450,000 gallons annually. Alcohol is also manufactured in large quantities. They have in the country between 180 and 185 distilleries; the annual product turned out is something over 3,000,000 gallons.

The wine industry is also an important one. The soil is very suitable for grapes, and vineyards cover vast areas of land. Along the great slopes of mountains such as San Juan and Neau Dosa, which lie west of Buenos Aires City, are to be seen perhaps the best districts for wine-growing. In 1901 the Argentine had over 90,000 acres in vines, which was valued at about \$10,500,000 gold. In 1903 she had 51,625 hectares under vines. In 1901 the stock of wine in the wine-warehouses or bodegas (bond) was about 871,000 gallons. In 1902 the importation of foreign wines was greatly diminished, and the increase over the 1901 production was enormous; 1903 figures could not be obtained, but the crop was a large one.

Although a good deal of machinery is imported into the country, the iron and steel industries are going ahead very fast; and, although there is practically no coal and not much ore in the country, it opens one's eyes to see how important this industry is becoming. They have in the Argentine over two hundred iron-foundries and 158 repair-shops. They manufacture nearly every class of machinery, including engines, boilers, &c. A large number of the railway-carriages and tram-cars are manufactured in the country; the only parts imported are the wheels. Steel safes are also made locally, and are rapidly taking the place of the imported article. So far as the iron industry is concerned, the imports into the country since 1899 have decreased nearly 50 per cent. The capital invested in these industries is between \$16,000,000 and \$20,000,000 gold.

The excise tax on tobacco and its products amounted to over \$10,000,000 gold in 1901. In 1903 no less than 167,000 tons of tobacco was exported. It is called "quesbracho" in Spanish.

About \$4,500,000 are invested in textile manufactures, which, including hat-factories and woollen-factories, give labour to upwards of 8,500

persons. They import 8,500,000 dollars' worth of linen which might be manufactured in the country.

As to mining in the Argentine, it is claimed they have valuable copper-mines, many of which contain gold and silver. They have also lately discovered rich veins of gold and also iron-ore. I might add, however, that these products have not been developed to any extent.

There is also borax, lead, and marble in the country. It is believed that the rivers of the Argentine are rich in gold, and that dredging will shortly become a paying industry; but if they meet with the same experience as most dredging undertakings in our colony, I should not care to invest very heavily in the new shares. They have formed a gold-dredging company in Buenos Aires, with the object of exploring and working the auriferous sands of the various rivers. One thing which is certain is that they will not meet with such obstructions as timber and rocks or boulders in the beds of the Argentine rivers, which are nearly all composed of sandy bottoms.

11. THE CONSTITUTION AND CIVIL RIGHTS OF THE COUNTRY.

The National Constitution of the Argentine Republic is based upon the broadest principles of liberty and justice, and affords the most ample guarantees for the enjoyment of full civil rights by and for the protection of the material interests of all the inhabitants. In one of its first articles its principal objects are declared to be "to create national unity, to consolidate justice and internal peace, to provide for the common defence, promote the general welfare, and to assure the benefits of liberty to us, to our descendants, and to all the people of the world who may reside in Argentine territory." In this instrument provision is made for a separate but correlative existence of the powers forming the Federal and the Provincial Governments, the constitutions of the various provinces being based upon the same republican representative federal system in accordance with the principles, declarations, and guarantees of the National Constitution. Thus, all the public Acts and judicial proceedings of one province have the full force of law and authority in the others. Act 20 of the National Constitution declares "that foreigners may freely exercise their callings of any profession for which they are qualified, navigate the rivers and coasts, make testamentary dispositions, marry in accordance with the laws of the republic, own and deal in real estate, and, except from differential taxation, travel, associate for lawful purposes, petition, and do all such things as may be legally done by born citizens of the State. They may obtain naturalisation papers on completing a term of two years' residence in the country, or such lesser term as may be fixed by the Executive Government in cases of proof of service to the State, such naturalised citizens being immune for a period of ten years from date of naturalisation from compulsory military service." Other articles of the Constitution provide for the free exercise of all religions, and establish the principle of official encouragement to European immigrants, especially laying down that the Government shall at no time limit, or reduce, or charge with taxes the entry into Argentine territory of foreigners whose object is to devote themselves to agriculture, industry, science, or the arts.

Foreigners, after four or six years of naturalisation respectively, become eligible for election as national deputies or senators, but without being naturalised may hold administrative and official positions in the Executive Government. The Government of the nation is divided into

three branches established by the Constitution—(1) the legislative power which makes the laws; (2) the executive power which carries them into effect; (3) the judicial body which construes and applies them in cases of conflict. The executive power of the nation is exercised by the President, who must be born in the republic and profess the Roman Catholic religion. The President is the supreme head of the nation, and has charge of the general administration of the country, assisted by a Vice-President and eight Secretaries of State, the latter being directly appointed by himself. The legislative authority is vested in a National Congress, consisting of a Senate and a Chamber of Deputies, the former numbering thirty, two for each province and two for the capital, elected by a special body of electors in the capital and by the Legislatures in the provinces. A senator must be thirty years of age, have been a citizen for six years, possess an income of \$2,000, and be a native of the province for which he is elected, or have resided two years therein. A senator is elected for nine years and may be re-elected. A third of the Senate is renewed every three years. The deputies are elected by the people in the proportion of one for every 33,000 inhabitants, or fraction not below 16,000. At the present time there are 120 deputies. The age qualification is twenty-five years, four years' citizenship being obligatory. They are elected for four years and may be re-elected, half the number retiring every two years. Both Chambers sit in ordinary session during each year from the 1st May until the 30th September. The Vice-President of the republic is Chairman of the Senate, but otherwise holds no political power. Should the positions of President and Vice-President become vacant the Senate has the power to fill the vacancies. The President is Commander-in-Chief of the Army and Navy, and appoints to all civil, military, and judicial offices, subject to the approval of the Senate, and has the right of presentation to bishoprics.

12. POPULATION AND IMMIGRATION.

According to the census of 1895, there were in the country about 3,000,000 Argentines (all children born there of foreign parents are Argentines) and about 500,000 Italians; these latter by far the largest number of immigrants, and they are far better than the emigrants of the same nationality that go to the United States, from what I have seen. Some of the best and most intelligent people in all kinds of business and industries, especially in agriculture, are Italians. Next come the Spaniards, over 200,000 in number; next French, somewhat less than 100,000; next English, about 22,000; next Swiss, 15,000; and lastly the North Americans, as we are called, 1,400. These figures refer to the year 1895. The number of foreigners in the country at the 31st December, 1899, was 199,808, an increase of 20 per cent. on the returns of the year 1895. Immigrants in forty-four years, 1,835,077; Italians, in forty-four years, 1,198,550; Spaniards, 361,079; French, 162,636; British, 34,031; Austrians, 31,698; Germans, 27,834; Swiss, 24,873; Belgians, 19,082.

13. COLONISATION.

The national and provincial Governments have made great efforts to promote colonisation on the large tracts of land which are available for settlement throughout the country. Private industry has also done a great deal in this same direction. The railway companies did a great amount of work in the early days of the opening-up of the roads, and

largely by British capital new settlers were induced to settle on the agricultural and stock-raising land, particularly in Cordoba and Santa Fé, which is the central part of the Argentine. Many of the wealthier Spanish people have done a great deal to encourage settlement on the land. During the past few years the colonisation "stroeder" and the railways have organized about thirty colonies on the land, which cover more than 400,000 hectares, which also have twelve or thirteen new towns with a population of about 17,000 souls.

As pointed out in a previous article, the Government offers every facility for new settlers purchasing land on time payment.

14. EDUCATION.

In reference to education, the primary education is compulsory from the age of nine to fourteen; secondary education from fourteen to nineteen is optional, as also the university or higher education from nineteen to twenty-five or twenty-six. No man can enter into any of the professions, including engineering, and take a prominent position in the Government without being a graduate of the National University, and having taken the course outlined in the above division of ages.

In 1901 there were 470,000 pupils in the public schools, which are free to all, and free to people of all religions. Although the Catholic religion is the national religion, neither it nor any other religion is allowed to be taught in the schools.

In the National University there are four faculties—law and social sciences, medicine, exact physical and natural science, and philosophy and letters. In 1901 there were 3,562 students in the University.

15. BUENOS AIRES.

THE CITY.

I cannot conclude without giving a description or some information about the beautiful and really great city of the world—Buenos Aires—and a brief outline of its characteristics, history, size, and general features.

Its early history is full of trouble. Founded in 1535, destroyed and rebuilt; and then from 1650, when there were four hundred houses. In 1852, when the noted President Rosas was turned out, Buenos Aires had 76,000 inhabitants; in 1864, 140,000; in 1887, 400,000; in October, 1902, 864,513; and at the time of my visit this city had over a million souls. It is now the largest city in the world south of Philadelphia. Comparing its present rate of growth per decade with some other cities we find that Greater London has 20 per cent., New York 37 per cent., and Buenos Aires 40 per cent.

The city is on the bank of the River Plate, a sloping bank over 60 ft. above the level of the water, rising up to considerable elevations in the centre of the city. It is about 120 miles from the sea at Monte Video. Its area is one of the greatest in the world, 44,830 acres; Paris has only 19,280; Berlin, 15,525. It is a good day's journey to go all round the city, as its perimeter measures thirty-nine or forty miles.

The style of the city is cosmopolitan, generally speaking, in buildings, in stores, in residences, in dress, in habits and customs of the people. It is made up of many nationalities.

There are seventy-five parks and small gardens outside main streets,

with a combined area of about 1,400 acres. These parks are most tastefully laid out and more neatly kept than in any other country in the world, Paris, perhaps, excepted. The style of the houses of the wealthy people can be seen on Avenida Alvear.

The pavements are wood (nearly all hard, suitable wood of the country), asphalt, granite blocks, macadam, and rubble. No city has better pavements in the central part. In the outskirts, however, much of the pavement is very bad and uneven, merely rubble, but immense sums are being expended in substituting for rubble granite blocks and asphalt.

The streets are laid out in the form of a chess-board, and are generally about 360 ft. apart from centre to centre. In the old or the central part of the city the streets are narrow; it is difficult for three carriages to pass. There are, however, a few 33 ft. wide, and one or two avenues about 100 ft. to 110 ft. The finest street, said to be the best lighted in the world, is the Avenida de Mayo, which is in the centre of the city. As to the numbering of the houses north and south, this is perfect. It has a fine asphalt pavement and double electric lights in the centre. It was cut through the blocks a few years ago from the Casa de Gobierno (Government House), near the port, to the Thirteenth Street, somewhat less than a mile away. At the other end there is being built a beautiful Capitol building that will cost about \$5,000,000 gold.

There is a project of national concession for a system of underground electric tram-lines, connecting the three main railway-stations with the Plaza Victoria, and in one direction extending by a surface-line far out in the country.

There is no city anywhere of its size, in my opinion, with more lines of street-cars; in fact, with the exception of two streets, there is a line in every one of the principal thoroughfares. And leading out to the pleasant suburban towns, Belgrano, Palermo, and Flores, there are electric lines similar to those in American cities, using the overhead trolley. In fact, all the equipment from rails to trolley comes from the United States instead of from England. Very extensive changes are being made in all parts of the city, substituting electric for horse cars. There are now 275 miles of street-car lines, which carried in 1900 116,447,982 passengers. If there are any electric railways in any part of the world which should pay it should be those lines in the City of Buenos Aires, for the conditions are specially adapted to their easy construction, the material being suitable for tunnelling, and a great mass of people crowded into the "centre" with its narrow streets, where the present surface movement is often extremely congested. A United States citizen has the concession.

The climate in Buenos Aires, taking the whole year round, is said to be very agreeable. The parks are always green, vines and palms and a species of banana plant are seen everywhere, and flowers grow all the year in the open. They procure the plants from the semi-tropical regions in the north of the country and from Paraguay, where the *Victoria regia* and other beautiful plants grow wild.

The history of the lighting of streets in the city is very interesting, and shows that the city keeps pace with others in this respect. The first record of public lighting is said to be in 1778, when the city had lamps in the form of a tin of horse-oil, with a wick; then came tallow dips; then oil-lamps; then came gas in 1885, and in 1888 electricity began to replace it in part; and on the 31st December, 1900, the city was lighted with 889 arc lamps, 318 incandescent of sixteen-candle power, 14,084

gas-lamps, many with the Welsbach burner, and 8,590 kerosene-lamps. And there were thirty-six electric-light stations, with a capital of \$9,000,000 gold, and with a capacity of 23,300 electric horse-power.

The means of locomotion about the city are abundant—street-cars everywhere, and a very good and economical cab service. There are few coupés, no public hansoms, and only one or two private ones; but the street-carriages are two-horse victorias, which carry four people. The private turnouts are equal to any of those I have seen in the United States or Canada, especially the horses, which are of the best imported stock. The "Corso" and the approaches to it on a Saturday or Sunday afternoon are very attractive. It is when in the beautiful park of Palermo, one of the suburbs—broad avenues, beautiful shrubbery, lakes, and shady drives, and immediately in front the broad River Plate—that one is impressed.

The house-fronts, when kept in repair and painted, are neat and architecturally beautiful. The words "répair" and "painted" might be explained. There are no wooden houses, which these words might imply; they are nearly always made of rough brick, covered with what is called "revoque" in Spanish, a covering of plaster or staff mortar and sometimes artificial stone. The better class of houses generally have a base of granite, marble, or other natural stone 3 ft. or 4 ft. high, and then brick covered with "revoque." Sometimes the natural stone extends to the second story, and then invariably comes the artificial covering. After a while—two or three years—this begins to discolour and flake off, requiring painting and repairing; after ten years it begins to become an eyesore, and at the end of fifteen or eighteen years it must all come off at a very considerable expense.

The people show great taste in the arrangement of their stores, and particularly the shop-windows; from a butcher's shop to a confectioner's and a lace-store fine taste is visible everywhere. A walk along Florida Avenida, the principal shopping-street—a fine asphalt street with no street-cars on it—is one of the delights of Buenos Aires, and one never tires of it. If for a week you miss this promenade you hardly know the street, for the appearance of the stores has been greatly changed in the meantime by a complete change of the decorations.

The manner of living is Continental, not even English—a cup of coffee with a roll in the early morning; breakfast at 11 to 12.30 (which is a meal in courses), and dinner at 7.30, the principal meal of the day. This is the custom among all classes, high and low; and there is another custom (it is strange how soon you fall into it), tea or coffee, or "matte" (a species of steeped herb—"yerba"), pressed into a peculiar little gourd used as a bowl and drawn out of it with a hollow silver tube called a "matte-stick," a sample of which I have brought home with me.

The Spanish language, which is the national language, is spoken everywhere; but, as might be expected in a cosmopolitan city, French, Italian, English, and German are spoken almost everywhere, particularly French.

As English money and Englishmen have done more than any to develop the country, have built, own, and run nearly all the railways, many of the great estancias, and other businesses, particularly commercial, the English have a large say.

The telephone service is in the hands of private companies; the capital invested is over \$10,000,000 gold; there are about twelve thousand subscribers. There are no really long-distance lines, except one recently opened to Rosario district.

The city has a very extensive system of water and drainage works, costing nearly \$40,000,000 gold, discharging the sewerage fifteen miles distant, and the storm-waters by great sewers, now being completed, into the river in front of the city. The city waterworks take their water above the city, where it is never contaminated.

The water of the River Plate is good, but of a reddish colour or muddy. It is clarified in settling-basins before being delivered to the distributing-reservoir, built on one of the highest points of the city. The distributing-reservoir is a work of art, and well worth seeing; it is covered with glazed tiles, over which is pressed brick. These works altogether have made Buenos Aires one of the healthiest cities in the world, as the death-rate proves. The Government is soon to extend the works at a cost of five or six millions gold. Ten years ago, upon the completion of the main works, the mortality per 1,000 was 30; now it is 16½. This compares very favourably with other large cities. London has 19.2, Glasgow 21.6, New York 19.7, Philadelphia 17.7, Boston 19.0.

Buenos Aires is well provided with newspapers. They have, all told, over one hundred and fifty monthly, weekly, and daily papers. There are five small English papers published, three German, one Russian, and one Basque; the balance are composed of 119 Spanish, eleven Italian, and nine French. There have also been established lately three periodicals in the Scandinavian language; also two more in Basque, one in Hebrew, and one in Arabic. It is said, and I believe truly so, that the national daily newspapers are as keenly alive to the necessities of modern thirst for daily information as in any country in the world. The supply of cable and telegraphic news from all parts of the world is really excellent. This latter may be said more particularly of that wonderful Spanish paper *La Prensa*. I only wish I could show a photograph of this wonderful newspaper institution. This building is one of the grandest structures in Buenos Aires. It stands in a prominent position facing the grand street Avenida Le Mayo. The *Prensa* building is devoted entirely to the morning paper. Of course, if the Wellington people received fifty thousand copies of it some morning instead of the *Post* and *Times*, it would not be of much use to them. I think I can say that there are no newspaper-offices in the world that can compare with this building in elegance and convenience in all its interior appointments. The room where guests from foreign countries are received is the most delightful sight I have ever seen. The stairs leading into the main entrance, and the main banister, are a masterpiece, being constructed in a most elegant design from solid blocks of granite and beautiful marble. The reception-room is such a masterpiece I could hardly describe it and give it justice.

THE HARBOUR.

I must say something about the wonderful harbour of Buenos Aires, which is a revelation to any person who has never seen it. Particularly noteworthy are the new docks, which are very extensive, and lie along the immediate front of the city and connected with it. They were designed by the well-known English firm of engineers, Hawkshaw and Hayter, and carried out under the supervision of Mr. James Dobson, the resident engineer. The concessionaire was an Argentine. In 1885 the National Government began the construction of very large docks at Buenos Aires; hitherto all the business had been done from the anchorage, about twelve miles from the city, the intervening space being a great mud bar, the

water from a depth of 25 ft. gradually shoaling to the shore-line at the city. This was so flat that it was necessary often to transfer the passengers and goods from the lighters, in which they had come from the vessels, to small boats, and then to great wheel carts that went out a long distance in the water to meet the lighters.

In order to reach the docks from the sea, a channel has had to be excavated in the mud from the anchorage. This channel (the North one) is at low tide 21 ft. deep and 330 ft. wide, and about five miles and a half long from its intersection with the channel, which already existed by previous dredging from the other end of the port, at the mouth of a small sluggish stream called the Richuelo. The tide of 2 ft. or 3 ft., depending largely upon the direction and force of the wind and very uncertain, permits vessels drawing about 23½ ft. to enter the port by the North Channel. The new port was connected with the older port, and now both channels are being used, and the depths in them are about as stated above.

The works are built in the most substantial manner—masonry walls founded on what is called "tosca" (loess), the hard substratum that is found in this part of the country. The four docks, or basins, are from 620 to 750 yards long, and are all 170 yards wide, connected by passage-ways 22 to 27 yards wide, over which passes by hydraulic turning-bridges the foot, vehicular, and rail traffic. A sea-wall in front protects the entire port. On the city side are three- and four-story brick warehouses, thirty-two in all, with a total frontage of a mile and a half. Sheds, cattle-yards, railroad-tracks, hydraulic cranes and capstans, and other important appurtenances give the port modern facilities for handling cargo.

When the docks were opened at the southern end in 1899, the registered tonnage of vessels arriving and departing at the Port of Buenos Aires was 3,800,000; in 1901, 8,661,299, more than 100 per cent. increase. There are only twelve ports in the world of greater tonnage, and none of them show such phenomenal growth. In 1880, about the time that the works were proposed, the tonnage was 644,570, and the plans were made for 2,000,000 tons only. The Government has recently begun the extension of the North Channel straight out to the anchorage, and later will deepen it to 22 ft. or 23 ft. In the meantime the navigation uses a crooked channel beyond the intersection, which has been partly dredged. The depth of water in the northern entrance basin of the port is about 21 ft., but in the four great docks 23 ft., with tidal gates, so that the vessels at low tide may be afloat.

The plan also provides facilities for "inflammables"—coal, petroleum, gasoline, naphtha, and some explosives. The Standard Oil Company of New York is now arranging to bring bulk oil in tank steamers to Argentine, and the Shell Transport Company is preparing to make a specialty of the importation of fuel-oil from Texas and the Dutch East Indies.

The work of enlargement of the port is divided into sections, so that it can be carried out section by section, as the increase of commerce will require. The general plan also includes the protection and deepening of the entrance-channels.

One of the principal ports of the country is Rosario. Ocean navigation reaches it, and, for that matter, reaches Colastiné, the port of the City of Santa Fé, the capital of the province.

16. THE GREAT RIVERS OF THE ARGENTINE REPUBLIC.

Before concluding this brief report on my investigations in the Argentine, I am fully convinced that a report touching on the possibilities of agriculture would not be complete unless some information or particulars were given of the vast rivers of that great republic. Although I have seen the majority of the most important rivers in the Argentine, and was very much impressed with their vastness, I am nevertheless not an expert on the subject of great rivers. I therefore beg to quote from the work of perhaps one of the greatest living investigators of the enormous rivers of South America, Elmer E. Corthell, D.R.S.C. I may also point out that Elmer E. Corthell has for years studied and investigated nearly all the large rivers of North America, and his comparisons of them with the rivers of South America must prove interesting to New Zealand people.

In the year 1899 the Argentine Government conceived a very extensive project of river and harbour improvements, and at that time asked the United States Government for an expert engineer to execute the plans. The result was that Elmer E. Corthell, D.R.S.C., was selected, and the extracts quoted are from the work on his two years' labours in the Argentine.

My object in bringing this question of rivers before the agriculturists of New Zealand is with a view to pointing out the advantages this great republic holds over many other agricultural exporting countries. In the first place it must be remembered that where a country has so many marvellously large rivers penetrating the agricultural districts, in some cases to the extent of four hundred miles, they afford an easy and ready means of conveying the farmers' products to the sea-coast at a much lower cost than by railways. That is not all: in many of the best agricultural districts these great rivers act as a valuable source of irrigation for the land. Even the smaller rivers assist in this direction, for the reason that when slight floods take place a valuable amount of plant-food is left on the land, which naturally tends to add to the general fertility of the soil. Dealing with this subject, Mr. Corthell says,—

"First, a deep shore-line of the Gulf of Mexico, in the United States, when the site of Galveston was far out in the waters and the coast was a hundred miles inland from the site of New Orleans—a wide and deep estuary a thousand miles long, reaching into the heart of the continent to between St. Louis and Cairo, where, at Cape Girardeau, it met the ridge of the Ozark Mountains stretching across the valley and holding back the ancient great lake, which covered Chicago 200 ft. deep and spread over all the great prairie States, and received and distributed over its bed the immense sediments of the Missouri and other great rivers in the north. Then came the cyclic change, lifting Florida out of the water and turning continental drainage north, cutting its way through the alluvion to Hudson's Bay. Then the breaking-down of the Ozark barrier, the draining of the submerged area; the subsequent filling of the estuary, and the advance of the alluvial lands into the gulf to their present line, 110 miles beyond New Orleans. A great and wonderful beneficence for the use and convenience of man by the Great Architect of the Universe.

"Had not my engineering experience upon the Mississippi River and its delta drawn my attention to this extremely interesting ancient history of the great river of North America, I might not have been so deeply impressed by its remarkable similarity to that of the Paraná River in

South America; and for both histories I am indebted to engineering investigators, General Warren in the first instance, and Colonel George Earl Church, an American engineer, in the second instance, the latter probably better acquainted by personal contact with the geography and hydraulics of South America than any living man. I am indebted to him and to the Royal Geographical Society, of which he is a director and a correspondent, for most of what follows in relation to this *ancient* history of the great rivers of Argentine and Central South America.

"There are four great breaks in the mountain-fringed continent, which we call its great commercial doorways—the Orinoco, the Amazon, the La Plata, and the deep indentation of Bahia Blanca—one in Venezuela, one in Brazil, and two in Argentine. The three river-basins occupy two-thirds of the entire area of South America.

"The two with which we are most interested are the La Plata and Amazon, which have areas respectively of about 1,200,000 and 2,722,000 square miles. But if we deduct from the latter the valley of the Tocantins, which has no direct connection with it, the valley of the Amazon is 2,368,000 square miles; its principal branch, the Madeira, has a volume of discharge nearly equal to the Amazon itself, and at the falls, which I shall refer to later, it carries annually a volume equal to that of the La Plata, which has a minimum flow of about 534,000 cubic feet per second and a maximum of over 2,000,000—a river 80 per cent. larger than the Mississippi, the Father of Waters, if we compare their mean annual discharges, the former being about 288 cubic miles and the latter 156 cubic miles. The Paraná (the 'Mother of the Sea' in Indian language), the principal affluent of the La Plata, is itself 46 per cent. larger than the Mississippi, its mean annual discharge being about 230 cubic miles.

"What a river the La Plata must have been in ancient times, when it had a maximum discharge of 4,000,000 cubic feet per second, well up towards the modern Amazon, estimated to be 5,297,000, and greater than the ancient Amazon!

"I have described the ancient conditions of the Mississippi—the Gulf of Mexico as a great estuary and a deep shore-line extending well into the heart of the North American continent. The same conditions existed in the contour-line of South America in the La Plata estuary. It extended fourteen hundred miles into the continent, and was four hundred miles wide, eleven times greater than the Empire State. It was the great Pampean Sea, receiving the drainage not only of the present Paraná and its tributaries, but of the great Madeira River, with its immense discharge of waters and sedimentary matters—the source of great alluvial formations discharging into a sea two-thirds the size of the Mediterranean.

"When, in the processes of nature, the great under-water plains of rich soil had been formed during the comparatively short period of less than one hundred thousand years, a dam was thrown across the Madeira by the rivers Grande and the Parapiti coming down from the Andes, and a deposit more than 170 ft. deep occurred forming this dam, which produced the ancient Lake Mojos with an area of about 115,000 square miles, larger than that of the Great Lakes of North America combined, which is less than 94,000. The remarkable action of these rivers and the changes caused by it are graphically told by Colonel Church in his paper upon 'Argentine Geography and the Ancient Pampean Sea':—

"The Grande and the Parapiti entered the plain with a northern trend to contest with the great river of the north the possession of the

gap. They struck it almost at a right angle, and slowly pushed their rival eastward over against the Chaco base of the "Chiquitos Sierras." Here the final conflict must have taken place, as the Grande and Parapiti threw their dam across the outlet of the Mojos River, thus cutting off its exit into the ancient sea. No doubt the giant stream waged fierce war for thousands of years to keep its channel open, alternately sweeping away the barrier and again yielding to the ceaseless volume of sand and clay, which, visible to-day, confirms the victory of the Grande and Parapiti. The dam having finally become permanent, the formation of the ancient Lake Mojos was assured. When it reached the level of the lip of Guajará-mirim its waters commenced to tumble over it and carve their way to the Amazon. Since then huge volumes of alluvium have poured down the northern slopes of the Bolivian Andes; the ancient lake is now almost loaded with material, but it is not yet entirely obliterated. The muddy silt which covers the surface of the basin is so fine that when an Indian goes up stream to the mountains his friends ask him to bring back a stone that they may see what it is like. Since forming the dam the Rio Grande has slowly been returning westward down the counterslope which its own alluvium creates.'

"During the process we have described the ancient lake and the Pampean Sea were connected, and their relation was similar to that of the Black Sea and the Mediterranean. Traces of it are still observable, notably the great, low, flooded morass of Xarayes, on the upper Paraguay River, and the ancient delta of the Paraná, including the Ybará Lagoon. The Selina Grande was also an arm of it—a great inland fiord. The sea, moreover, must have covered large areas of the provinces of Paraguay, Corrientes, Entre Rios, and Uruguay, and before the uplifting of the country it extended south-west to the Rivers Chadi-Leofu and the Colorado, lapping round the southern slope of the Ventana Range until the curved rim, concave to the north-east, which connects this with the Sierra de Cordova, was sufficiently elevated to completely cut off its south-western extension.

"This range was high enough to lodge the glacial rocks coming from the Andes, one of which, at Tandil, is so poised and delicately balanced that the hand can rock it, but it cannot be dislodged. This range later prevented the entrance of the destructive sea, protecting the great area from its waves.

"Then came another factor into the beneficent problem of the Creator. Instead of draining the waters from the great deposits under the Pampean Sea, as He did in North America, He lifted the Andes higher, and with them their Atlantic slopes, until the latter were ultimately lifted to their present level, forming the "Plains of the Pampas," the soil of which is 50 ft. deep and of surpassing richness—an area of 600,000 square miles, one-fifth the size of the United States, and five times that of Great Britain. Thus by cyclic changes in the Northern Hemisphere, and by fluvial and sedimentary action and seismic changes in the Southern Hemisphere, have been formed the great interior agricultural regions of the United States and Argentina.

"Let me now quote from Mr. Revy's work on 'Hydraulics of Great Rivers' (Argentine rivers which he surveyed), where he compares the rivers as we now find them with others well known:—

"Great as the volume of the Paraná River at its lowest summer level is, immense in comparison to the largest European river, and much larger than that of all the European rivers put together, it is but a small fraction of its flood-volume during exceptional rises; and we can only

wonder at the magnitude of the sources which for months, nay, for whole years together, pour forth inconceivable masses of sweet water, every drop of which has been raised by the power of the sun from the Pacific and Atlantic Oceans above the tops of the highest mountains of Brazil and the Andes.

“The Mississippi, in the United States of America, is not unlike the Uruguay in dimensions and other features—we have similarity in width, depth, currents, and fall, although the North American is the larger of the two. Comparing, however, the Paraná with the Mississippi, the former might claim the latter as his eccentric daughter under fourteen. The low-water dimensions measure a river's greatness, although things of different natures and character do not bear strict comparison. What we, however, understand by greatness is possessed in an exceptional degree by the Paraná.’

“In order, further, to compare the Paraná River with others, it may be stated that its annual flow is double that of the Ganges, three times that of the St. Lawrence, four times that of the Danube, and five times that of the Nile. We have records of 380 cubic miles in one year.

“There are differing conditions of importance between the Paraná and the Mississippi, explaining the causes of the greater discharge of the Paraná. While they both flow south, one flows from colder to warmer and the other from warmer to colder regions; and it is in the warmer regions in both cases that the rainfall is the greater. On the Mississippi, in the northern regions, where we find the greatest drainage-area, the rainfall is about 35 in. per annum; in the southern, where the area is less, the rainfall is 60 in. per annum. With the Paraná there is a rainfall of about 60 in. in the northern part, where the drainage-area is greater, and about 40 in. in the southern part, where it is less.

“The length of the Paraná River is about three thousand miles; its navigable length, between Cuyabá in the north and the mouth of the Paraná in the delta of the La Plata, is 1,825 miles. The Uruguay River, from San Javier to the delta of the La Plata, has a navigable length of 603 miles. The Paraná River is made up of the two important rivers which unite at the City of Corrientes, the Paraguay and the Alto Paraná. The length of the latter above Corrientes to the falls of the Yguazú is 365 miles, and it is navigable nearly to that point. These wondrous falls excel in beauty, as well as exceed in dimensions, the Niagara Falls. The latter are 160 ft. high, as a maximum, and four-fifths of a mile long, including Goat Island. The Yguazú are 213 ft. high in one leap and 106 ft. in two leaps, and two miles and one-third long, with, at times, an immense volume of water. The gorgeous and varicoloured foliage of the luxuriant subtropical vegetation which abounds on all sides adds a charm to the falls. They rank among the most beautiful and wonderful works of the Creator. The ‘remolinos,’ or whirlpools, below the falls equal the famous whirlpool at Niagara.

“The Uruguay is an entirely different river in every respect from the Paraná. It is at times a mighty river rivalling the Paraná; at others it sinks into comparative insignificance. The Paraná is a great river at all times. The Paraná is a type of a truly great river; the Uruguay represents a mighty torrent of extraordinary dimensions. The Uruguay rises near the Atlantic seaboard in Brazil, in the Sierra del Mar, then runs west to the highland of the territory of Misiones. These highlands prevent it from uniting with the Alto Paraná River at that point, which is only about sixty-eight miles distant. Along six hundred miles of its course from San Javier to Concordia the bed of the river is filled with

rocky ridges, which at low water prevent continuous navigation, but during the floods, which are quite sudden but not long-continued, the river is everywhere navigable. The river rises, in floods, at Concordia about 46 ft. Compared with the Paraná, it is a clear stream, carrying very little sediment in suspension. The Paraná is an entirely different river. Its source being in the tropical and rainy region of Brazil, on the flanks of the Andes, its floods are much longer-continued. At the confluence of the Paraná and the Alto Paraná at Corrientes the rise of the floods is about 33 ft.; at Rosario, 225 miles above Buenos Aires, it is from 19.7 ft. to 23 ft., or 23½ ft. in extreme floods. When these occur the river is about twenty-three miles wide, covering the entire country with a depth of 6 ft. to 10 ft., and extending to the highlands of the Province of Entre Rios.

"The physical characteristics of the bed of the river are consequently entirely different from those of the Uruguay; the bed of the latter is stable, that of the former very unstable. The sedimentary matters carried in suspension, however, are very much less than those of the Mississippi; probably only one-tenth of the amount carried in the Mississippi in times of flood. For this reason the changes in the bed and banks are less radical; the most noticeable change is the movement of the islands and bars down stream. For example, the Island of Espinillo, in front of the City of Rosario, lying in the middle of the river and about two miles and a half long, has moved, flanking, down stream about two miles and a half in the last fifty years, and by this movement the advancing bar of the island has approached the river-bank in front of Rosario and closed up the navigation channel. The maximum velocity in great floods often reaches 6½ ft. per second, although usually it is much less, equal to that of the lower Mississippi.

"Both rivers are susceptible of improvement by dredging, the one to Asunción, which is 842 miles above the mouth, and the second to Concordia, which is 230 miles above the mouth. In the Paraná there is nothing but sand to be removed throughout its entire length; in the Uruguay there are several places where it is necessary to remove rock and gravel. But, generally, the channel can be deepened by hydraulic or suction dredging.

"The National Government is under obligation, by the law passed by Congress for building the Port of Rosario, to make and maintain a depth of 21 ft. at low water in the Paraná River from the head of the delta to Rosario, and in the delta of the La Plata to Buenos Aires a depth of 19 ft. at low water, which is about 21 ft. at mean high tide. It has been proposed to make and maintain a channel of the following dimensions: From the mouth of the two rivers, at the Island of Martin Garcia, at the head of the La Plata estuary, to Rosario, a depth of 21 ft. and a width of 328 ft. Rosario to Santa Fé, 292 miles above Martin Garcia, 19 ft. deep and 328 ft. wide; Santa Fé to Corrientes, 10 ft. deep, and the same depth to Asunción. Santa Fé, or its seaport Colastine, is the head of ocean navigation; above that point it is river navigation by steamboats.

"On the Uruguay River it is proposed to make a channel 19 ft. deep and 328 ft. wide from Martin Garcia to Concepcion del Uruguay, 137 miles above Martin Garcia, and thence 15 ft. deep to Colon, and 9 ft. deep and 8 ft. over the rock to Concordia, which is 230 miles above Martin Garcia.

"The low-water plane, or zero, in both rivers is that of extraordinary low water, so that, generally, the low water does not reach this plane

within about half a meter to a meter. Consequently, there can generally be depended upon from 2 ft. to 3 ft. more water than I have stated. Between Rosario and Buenos Aires there are now no bars over which there is not 21 ft. of water at zero, although two of them need to be dredged and buoyed in order to make a straighter channel. This the Government is prepared to do.

"As to the Port of Rosario: a contract has recently been made, under the law of Congress, to make a modern seaport at this point, with all the latest and best facilities for handling cargo. The commerce of Rosario is at present 1,500,000 tons per annum. It is a very important exporting-point for cereals, and when the port is completed according to the plans adopted, it is expected to be an important importing-port as well. There are ports below Rosario, such as Villa Constitución, San Nicholas, and San Pedro, and above Rosario, Diamante, Santa Fé, Colastiné, and Paraná. On the Uruguay River, Concordia, at the head of steamboat navigation, is an important importing and exporting port for that section of the country. Its registered tonnage is about half a million tons, and the actual-weight tonnage about 100,000.

"The country between the Paraná and Uruguay Rivers is practically isolated from the rest of the country, and its situation is very similar to that of the country lying between the Euphrates and Tigris; for that reason it has been called the 'Mesopotamia Argentina.'

"There are at present in this area three railroad systems—the Argentine North-eastern, which runs from Corrientes, on the Paraná to Monte Caseros, on the Uruguay, and from there to Santo Tomé, on the same river; the Argentine Eastern, from Monte Caseros to Concordia; and the Entre Rios Railroads, the main line of which connects Paraná and Concepcion del Uruguay, with branches to Victoria, Gualeguay, Gualeguaychú, and Villaguay. Within a few months a connecting-line will be completed to Concordia, forming a link between the Argentine Eastern and the Entre Rios systems. It has been proposed to unite these three systems, and to extend the Argentine North-eastern from Santo Tomé to Posadas on the Alto Paraná, passing through the colonies which the Government is establishing in that territory. Posadas is its capital. The Central Paraguay Railroad, which runs in a south-easterly direction from Asunción, it is proposed to extend to Villa Encarnación, a small town on the opposite side of the river from Posadas; to change the gauge, which is 5½ ft., to the normal gauge of the other three railroads, which is 4 ft. 8½ in.; make a transfer by car-float at Posadas; extend the Entre Rios railroads to a port of deep water, either on the Paraná or Uruguay, and do a 'through' business between Asunción and this new seaport, which will be only a few hours distant from Buenos Aires.

"With the Paraná River improved to Asunción and the Uruguay improved to Concordia, with the railway systems united and extended to a good seaport, this great interior district of the country will have an ideal system of transportation, and the shipper may take his choice to ship by rail or by water, thus establishing a very useful and reasonable competition between water and railway, to the great advantage of the people.

"In reference to the Rio de la Plata itself, it is an immense shoal estuary. It is the depositing-ground of the great Paraná River. This estuary, in not a very remote period, extended above Santa Fé; this is shown by the comparison of old maps, of which ninety-two have been collected and copied and placed in the Library of the Ministry of Public Works. These maps date from the year 1529 to 1885. Even in this com-

paratively short period remarkable changes are shown in the delta of the Paraná, which is now a true delta, almost exactly in the form of the Greek letter Δ . It is forty miles across its face; it slowly extends itself in the head of the estuary, and through the delta nearly a dozen outlets of the Paraná River find their way. It is very much like the deltas of the Danube, Ganges, and Mississippi.

"The superficial extension of the Rio de la Plata exceeds 18,000 square miles; it is about 186 miles long, and varies in width from 186 miles at the ocean, between Capes San Antonio and Santa Maria, to 1.12 miles at the extreme point of the head of the estuary, at Punta Gorda.

"To understand the physical conditions of the estuary, it is necessary to divide the Rio de la Plata into superior and inferior, or upper and lower. The Rio de la Plata Superior lies above a line extending between La Plata and Colonia, the Inferior below that line to the sea. Over a distance of about twenty-five to thirty miles between Martin Garcia and the anchorage of Buenos Aires there is a normal depth through the best channels of from 16 ft. to 20 ft. at low water.

"The National Government has recently completed the dredging over the San Pedro bar lying in this region, increasing the depth of $18\frac{1}{2}$ ft. to 21 ft. where there was formerly only 15 ft. In the Canal de las Limetas or Nuevo Canal, by natural forces and by the constant movement of steamers there has been obtained a depth of about $19\frac{1}{2}$ ft. or $21\frac{1}{2}$ ft. at mean high tide. Opposite Farallon, a rocky point on the Uruguay shore and opposite Buenos Aires, there is along the course of navigation about $19\frac{1}{2}$ ft. at low water. The Government has buoyed with luminous buoys the entire route from Buenos Aires to the mouths of the Paraná River, the Bravo, and the Guazú, and has placed a floating semaphore below Martin Garcia for the benefit of navigation, recording constantly by signals by day and by night the depth of water in the channel. It is now proposing to connect this semaphore by a telephone cable with the telegraph cable of Martin Garcia, so that communication may be established between the ships lying at anchor (waiting for the tide or passing near the semaphore) and the offices of the agents at Buenos Aires or Monte Video.

"A careful study of the different conditions in the delta of the La Plata shows that the only method of improvement in such a vast expanse of water is by dredging and buoying the best channels. In the lower Rio de la Plata there are very serious conditions. A bar on which there is a least depth of 20 ft. at low tide lies between the anchorage of Buenos Aires and Monte Video. The material in this bar is very soft, and vessels plough their way through it on ordinary tides, but the great extent of the bar is the serious condition. Between the 24 ft. curves straight through this bar there is a distance of twenty-four sea miles. To make a channel by dredging would require the removal of probably ten and a half to thirteen million cubic yards; and it is very doubtful if, on such broad extension of water and in such soft material, a channel could be maintained. But it is hoped that the plan now proposed of anchoring five lightships in the line of navigation and in the direction of the current, which can be seen from each other, will have an effect upon the bar by the continued movement of deep steamers through it. The examination of the Rio de la Plata Inferior has been intrusted by the Government to the Ministry of Marine, which is making very extensive surveys and examinations over the entire area.

"The estuary at this point is forty-six miles wide, and five high
7—Ag. in O. L.

towers on shore and others anchored within the area to be surveyed are necessary in order to cover this great Punto Indio bank.

"These are the general physical conditions of the Rio de la Plata and its great tributaries.

"The very important project of making a deeper channel of access to the Port of Buenos Aires and enlarging the port, to give it not only a greater area and more facilities, but greater depth in the enlarged part, is now before the Government, and the plans for it (made by myself) have been approved. There are alternate projects to meet the commercial necessities of the country—one is to deepen the present Port of La Plata and endow it with more facilities, where vessels drawing 24 ft. or 25 ft. may come in and go out at any stage of the tide; or to build a deep-water port, with a depth of not less than 30 ft., on the seaboard outside of the difficult conditions of the Rio de la Plata. A concession has been granted and a project submitted to the National Government for an artificial port in the great bay of Samboronoon, which is nearly opposite Monte Video, and another concession for a port at Mar Chiquita, near Mar del Plata on the ocean, has also been granted.

"In addition to the great drainage-basin of the La Plata, there are further south the large rivers Rio Negro and Colorado, which, combined, have a drainage-area of 464,000 square miles. The channels are not susceptible of improvement for a large commerce, but they will in the future furnish water for an extensive irrigation and steamboat navigation."

17. MEASURES, WEIGHTS, VALUES, ETC.

Owing to the fact that I did not have the time to figure, or, rather, convert, all the statistics which I have quoted from the Spanish metric system into English, I quote the following particulars:—

MEASURES.

Miles and Kilometers.—8 kilometers = 5 miles approximately (4.971 miles); 100 kilometers = 161 miles approximately (160.932 miles).

Acres and Hectares.—1 hectare = $2\frac{1}{2}$ acres approximately (2.471 acres).

Argentine "Baras" and Yards.—100 "baras" = 97.70 yards.

A meter = 39.37 English inches.

WEIGHTS.

Argentine Ton and English Pound.—1 Argentine ton = 2,025.60 lb.

Argentine Ton and Argentine Pound.—1 Argentine ton = 2,000 lb.

Argentine Ton and Kilogrammes.—1 Argentine ton = 918.80 kilogrammes.

One hundred kilos. (called a "quintel" or "fanega" in Spanish) is 220 lb. in English = 3.67 bushels of 60 lb.

One hundred kilos. is an Argentine ton.

2,205 lb. in English = 4.6 quarters of 480 lb.

VALUES.

£1 sterling (*lira esterlina*) has the fixed value of \$5.04 Argentine gold (*calle pesos "oro sellado"*). The gold dollar in August, 1903, was of 127.27 per cent., or, in other words, \$100 gold was equivalent to \$227.27 currency.



THE BARN AND OUTBUILDINGS OF A LARGE ESTANCIERO AND CATTLE-BREEDER, ARGENTINE.

